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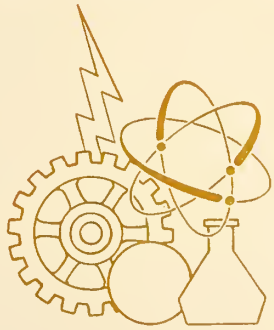

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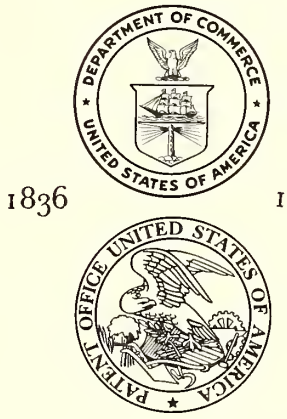
CELEBRATION OF THE AMERICAN PATENT SYSTEM



A Complete Summary of the Proceedings in Observance of the One Hundred Twenty-Fifth Anniversary of the United States Patent Act of 1836, Washington, D.C., October 18–25 inc., 1961.

U.S. DEPARTMENT OF COMMERCE
Washington 25, D.C.

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Letter of Transmittal

Washington, June 15, 1962

The Honorable The Secretary of Commerce,
Washington 25, D.C.

Dear Mr. Secretary:

I have the honor of transmitting to you the record of the proceedings observing the Celebration of the American Patent System commemorating the 125th Anniversary of the Patent Act of 1836 in accordance with a Joint Resolution of Congress and a Proclamation of the President of the United States. This record includes Part I, the proceedings of a series of seminars on the American Patent System, a report of an industrial exhibit, luncheons, the Anniversary Banquet and Part II, the proceedings of a conference entitled The International Patent Office Workshop on Information Retrieval.

Sincerely,

David L. Ladd

Commissioner

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Joint Resolution

Whereas there occurred on July 4, 1961, the one hundred and twenty-fifth anniversary of the enactment of the Patent Act of 1836 which created the present examination system for the grant of patents and which established the United States Patent Office as a separate and distinct Bureau; and

Whereas there will be granted in the year 1961 the three millionth patent since the enactment of this Patent Act; and

Whereas the patent grant is a traditional incentive for the promotion of the progress of the useful arts thereby contributing notably to the well-being of people everywhere; and

Whereas encouragement of invention is essential to the continued economic and technological development of this Nation, particularly in the light of our international relationships and obligations; and

Whereas it is fitting that this anniversary of this important Patent Act and the establishment of the Patent Office which proved so advantageous to this country and to the other countries of the world should be observed: Now, therefore, be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Commerce and the Commissioner of Patents and such other persons or groups as they may designate be authorized to make suitable arrangements for an appropriate observance to show the important role of the American patent system and the United States Patent Office in the growth and progress of the United States of America; and be it further

Resolved, That the President of the United States be requested to designate the week of October 15, 1961, as "The American Patent System Week", to invite a general public commemoration of an event which has proved to be so important to this Nation and to the world.

Approved September 22, 1961.

AMERICAN PATENT SYSTEM WEEK

By the President of the
United States of America

A PROCLAMATION

WHEREAS the year 1961 marks the one hundred and twenty-fifth anniversary of the enactment of the Patent Act of 1836 which created the present examination system for the grant of patents; and

WHEREAS in the year 1961 there will be granted the three millionth patent since enactment of the Patent Act; and

WHEREAS the grant of a patent is a traditional incentive for the promotion of the useful arts and thereby contributes notably to the well-being of people everywhere; and

WHEREAS encouragement of invention is essential to the continued economic and technological development of this Nation; and

WHEREAS it is fitting that the anniversary of the Patent Act and the establishment of the United States Patent Office should be observed; and

WHEREAS a joint resolution of the Congress approved September 22, 1961, authorizes the Secretary of Commerce, the Commissioner of Patents, and such other persons or groups as they may designate to make suitable arrangements for an appropriate observance of the American patent system and the United States Patent Office; and

WHEREAS the said joint resolution requests the President of the United States to designate the week of October 15, 1961, as "The American Patent System Week":

NOW, THEREFORE, I, JOHN F. KENNEDY, President of the United States of America, do hereby designate the week of October 15, 1961, as the American Patent System Week; and I invite the people during that week to commemorate the American patent system which, by affording protection and encouragement to inventors as envisaged and authorized by the Constitution, contributes so greatly to the encouragement of inventive genius.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the United States of America to be affixed.

DONE at the City of Washington this twenty-second day of September in the year of our Lord nineteen hundred and sixty-one, and of the Independence of the United States of America the one hundred and eighty-sixth.

By the President:

Acting Secretary of State

PART I

Proceedings Commemorating
the
125th Anniversary
of the
Patent Act of 1836

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Opening Session

Wednesday Morning, October 18, 1961

The opening session was called to order at 10 o'clock in the Departmental Auditorium, Washington 25, D.C., by Mr. Charles F. Gareau, Chairman, Working Committee.

Chairman Gareau: This meeting will please come to order. Under Secretary Gudeman, Commissioner Ladd, Provost Colclough, Mr. Larson, honored guests, and ladies and gentlemen, it is a great privilege to signal the opening of the Celebration of the American Patent System on the occasion of the 125th Anniversary of the Patent Act of 1836. The numerous organizations and groups which have contributed so generously of their time and energies during the past year are hopeful that the Celebration will be an effective instrument to indicate the vital role played by the American Patent System in the growth of our nation. In order that you may be aware of the manner of achieving this objective, I am pleased to present at this time a well known leader of the patent profession, the Chairman of the Policy Committee of the Celebration and at present the President of the American Patent Law Association, Mr. Roberts B. Larson.

Mr. Larson: Mr. Chairman, Under Secretary Gudeman, Commissioner Ladd, Provost Colclough, honored guests, ladies and gentlemen, it is indeed an honor and a privilege for me to take part in these opening ceremonies of this Celebration of the 125th Anniversary of our present patent system. While our first patent statute, as most of you know, became law in 1790, it was not until 1836 that the patent examining system came into being. It was then that the Patent Office was instituted as a separate bureau with the head office of Commissioner of Patents. It was 1836, then in fact, that our present patent system was born. The origin of this 125th Anniversary Celebration is found in the Resolution of the Executive Committee of the Patent Office Society passed August 31, 1960. This Resolution called upon all organizations interested in the advancement and increased effectiveness of the patent system to join in a celebration. As a result, representatives of the Section of Patent, Trademark, and Copyright Law of the American Bar Association, the American Patent Law Association, the Patent Committee of the National Association of Manufacturers, the Patent Office Society, and the Patent Office recommended to the then Commissioner of Patents, the Honorable Robert C. Watson, that committees be appointed to organize and execute a suitable program of events. Two such committees were appointed by Commissioner Watson: (1) a policy committee and (2) a working committee; and these were reappointed and continued by Commissioner David L. Ladd in April of this year after he became Commissioner of Patents. It was felt that there could be no better way of celebrating than to devote a few days to a public consideration of the patent system—its illustrious past, its present status as a vital stimulant to the economic growth and development of our country, with a look to its even more effective future. These aims have already found expression in the passage of the Joint Resolution by the Congress of the United States and by a Proclamation by the President of the United States, designating this week as The American Patent System Week. Invitations have been issued to all countries of the world asking them to send the heads of their patent departments or other representatives to these meetings. A national sponsoring committee of scientists and leaders of science and technology in the various branches of the Government was organized under Dr. Vannevar Bush. Finally, a 3-day program emphasizing the theme of the patent system and highlighting the legal and industrial aspects of the patent system and the modern economy has been organized. It is the sincere hope of all who have had a part in the arrangements of this program that

we shall all be rewarded by an increased knowledge of the working of the system on both a national and international scale and that this knowledge will assist us all in improving the system to the benefit of this country and to all peoples of the world.

Some years ago a great American and a great inventor, Charles Kettering, pointed out that many of the great events of civilization have not been recognized in their beginning. So it has been with the American Patent System. Little did our forefathers realize the ultimate effects of the legislation creating this system when they made it a part of the organic law in 1836. It is only by looking backward from our vantage point that the true greatness may be established. "Yet it is our duty," he said, "to do more than look backwards, more than commemorate, more than merely celebrate. Our duty is toward the future as much as it was theirs. That is why we honor the noble past with its proud record of accomplishments. While we evaluate and praise its vital present, we shall plan and work toward an even more significant future". All can only flourish through cooperative efforts of many groups and organizations. This is true of the American Patent System. It cannot flourish without assistance and the fostering of industry, of the legal profession, of the various branches of Government. It's a team proposition. One of the important factors or organizations upon which the patent system relies is, of course, the Patent Office. The patent system has been fortunate in that our Commissioners of Patents have been devoted to the patent system and were fully appreciative of what it could do for the American economy and for the benefit of the world. We have a new Commissioner of Patents, David L. Ladd. He is a man of energy, a man of good judgment. He is devoted to the patent system, and I am sure that he can contribute much during the term of his office to a betterment of that system. Ladies and gentlemen, it is my pleasure and my honor to present to you the Commissioner of Patents, the Honorable David L. Ladd.

Commissioner Ladd: Chairman Gareau, Under Secretary Gudeman, Provost Colclough, Mr. Larson, distinguished guests, and ladies and gentlemen, I am rather fortunate. Mr. Larson has done such an excellent job of providing you with the background and a statement of purpose of this meeting that my remarks can be rather short. We do gather to celebrate the 125th anniversary of the American Patent System. As Mr. Larson has explained to you, this was not the beginning of the patent system in America but it was the beginning of the examination system.

Our patent system is provided for in the Constitution itself. This 125th Anniversary coincides with the year in which we have issued the three millionth numbered American patent. Both of these events give us an occasion to celebrate the contributions of the American Patent System to the growth of the American nation and to assess and weigh its possibilities of service to the country in the future. In this effort we are grateful to have here with us representatives of foreign countries. We welcome this opportunity not only to celebrate the past but to weigh the problems and the future of the patent system in America and elsewhere. We welcome the opportunity of discussion with these representatives from abroad. We are grateful, too, to the scientists, educators, lawyers, legislators, and industrialists who have contributed of their resources and of their wisdom to the preparation of this meeting and who will continue to do so throughout its duration. This is an appropriate place too, I think, for a word of appreciation to the Working Committee under Chairman Gareau which has labored so long and lovingly on the preparations for this meeting. It is a pleasure, too, to acknowledge the contribution of the National Science Foundation in contributing a substantial sum to the end that next week American representatives and representatives from abroad can direct their attention together to one of the pressing problems in the American patent system, and that is the problem of information retrieval. We know that this meeting will be rewarding for us. We hope that it will be rewarding also for you.

It is my pleasure to introduce the keynote speaker of this Celebration. He is Edward Gudeman, the Under Secretary of Commerce. Mr. Gudeman was designated Under Secretary of Commerce by President Kennedy in January of this year. He was in the same month confirmed by the Senate and sworn into the office. Mr. Gudeman comes to the Government from a distinguished career in business, most of it with Sears, Roebuck and Company, where he rose to the position of vice-president in charge of merchandising and director of the company. Before coming to the Government, Mr. Gudeman was also a consultant to and a director of the Brunswick Corporation, and a partner of Lehman Brothers, the investment banking firm. In these positions Mr. Gudeman has had an opportunity to become acquainted with the patent system and the contribution it makes to the welfare of our people. It is a great

honor to introduce to you, the Honorable Edward Gudeman.

Under Secretary Gudeman: Commissioner Ladd, Mr. Gareau, Provost Colclough, Mr. Larson and distinguished guests from foreign countries, it is a distinct pleasure for me to represent the Secretary of Commerce, Luther H. Hodges, in greeting you—the representatives of industry, science, and government—and in welcoming you to the Celebration of the 125th Anniversary of the American Patent System. I am especially pleased that so many delegates from abroad have joined this Celebration. Early in the development of our country, it became apparent that the patent system would promote the progress of science. John Deere's steel plow and Cyrus McCormick's reaper, both patented inventions, were instrumental not only in developing our agricultural potential, but also in opening up and developing our country. The development and promotion of our great American agricultural economy is almost directly traceable to the patented inventions of these two men.

From the first patent system—the Commission for the Promotion of Useful Arts, manned by Thomas Jefferson, Henry Knox and Edmond Randolph—through the system we celebrate here—created in the Patent Act of 1836—the record of progress through patents is inspiring. In transportation, from the first patent granted, which involved an improved locomotive, to Westinghouses' air brake, to Wright's flying machine, progress has been the direct result of the system patenting these inventions. A brief chronology of the patents representing the development of communications brings into focus Morse's telegraph, Bell's telephone, Marconi's wireless and DeForest's vacuum tube. In every field of man's scientific endeavor, be it heavy industry, chemistry, metallurgy, the patent system has directly fostered the growth of knowledge. Carved in stone over the entrance to the Patent Office are the following words of Abraham Lincoln: "The Patent System added the fuel of interest to the fire of genius". In looking at the development of the American economy since the passage of the Patent Act of 1836 and at the chronological succession of inventions patented since that date, one can not help but conclude that the patent system did indeed add the fuel of interest to the fire of genius.

However, since the passage of the Patent Act of 1836, one-hundred and twenty-five years have passed. From a country based on an agricultural economy, we have progressed—largely as a result of the patent system—to a nation with a mighty industrial complex to add to our still great agricultural basis. As a world leader, we have all the responsibilities that go with such leadership. To a great extent because of the progress fostered by the patent system, our free economy has changed. The inventions of today are often complex—for a complex world: subtle surgical tools for the before unheard of operation: intricate circuitry for rockets; complicated data processing machines to aid us in further economic growth through basic research. One might perhaps question whether a system devised under an act passed in 1836 would still be capable of promoting scientific development in an economy far different from that envisioned by the enacting lawmakers. Of course, we must continually study and evaluate the causes which stimulate our economy, if we are to continue to grow and develop.

The patent system too has grown with the economy. Quantitatively, the three-millionth patent was issued to Dr. Kenneth Eldredge of Palo Alto, California on September 12, 1961. More than eighty-three thousand (83,000) requests for patents have been received in 1961. More than 27,000 trademarks are issued each year. To handle this large workload, about one-thousand Examiners, who are scientifically and legally trained, are employed by the Patent Office. This growth in the size of the Patent Office—the administrative body for the patent system—has also taxed the system created one-hundred and twenty-five years ago.

Mr. George E. Frost in a report for the Subcommittee, on Patents, Trademarks and Copyrights of the Committee on the Judiciary, United States Senate, recently stated that:

> Over-all, the patent system represents a vitally necessary institution to preserve and enhance the research competition that has characterised the post war economy. It is wholly consistent with the competitive economy as a whole, and the problems arising with respect to its relation to that economy can be handled with presently developed legal rules. As to the mechanics of the patent system, however, a number of changes are in order.

As Mr. Frost has pointed out, the patent system under the Patent Act of 1836 continues to influence the economy in three major respects. First, the patent system provides a protected market with the opportunity for profit which justifies the heavy investment in time, effort, and capital necessary to bring the improvement to the public. Second, this same protected market provides a wedge by which

a business enterprise entering a new field can overcome the obstacles that otherwise discourage entry into an industry already populated. Third, the ever-present threat of new firms with exclusive rights to new technologies compels existing enterprises to explore avenues of improvement upon pain of sudden obsolescence. All of these effects aid in generating a dynamic progressive environment under which the businessmen must compete not only in terms of production and sales technique but must also exert his talents in the direction of technological improvement. It is this encouragement of competition by the patent system which stimulates invention and progress in our economy.

The patent system stimulates competition in many forms. Color television gives us a vivid example of current competition in development. It is difficult to see how the principal companies involved in research in this area of development could underwrite such research in the absence of a patent system. Without the opportunity to recover the research and development investment through patent protection, industry would be less likely to enter fields of development.

Another example of competition in research is found in the field of oil refining. Initially petroleum refining was little more than a simple distillation process. The demand for large quantities of gasoline increased, but research was practically unknown in the field. Dr. William M. Burton perceived the opportunity to increase gasoline yield through thermal cracking. The cracking process was patented in 1913. A whole new era in petroleum research evolved. Competitors devised new processes and patented them. Today, the petroleum industry continues its competitive research. However, the story of competitive research in petroleum is even more dynamic than at first supposed. A new industry has been spawned by the research in petroleum—the manufacture of photochemicals. Today photochemicals are raw materials for synthetics and detergents.

Undoubtedly, in the absence of the patent system, industries would carry on some research—but on a secret basis. This would slow the pace of activity and would impede cross-fertilization between competing firms. Perhaps the greatest challenge to the present patent system comes from our changing world. As the world about us grows and prospers, it becomes more imperative that our own inventors be challenged. A healthy economic competition between the nations of the world could be the result of the promotion of continued scientific research here and abroad.

From a purely selfish viewpoint, our present Patent System must stimulate economic progress in the future as it has in the past, if we are to maintain our economic leadership in an international economic atmosphere that is becoming more and more competitive. From a larger viewpoint, the whole world is bound to gain from the progress stimulated by the reasoned application of the patent system to future scientific advancement.

It is my firm belief that although the patent system created in the Patent Act of 1836 may be augmented and improved as the economic conditions so warrant, the patent system will continue to serve, and therefore stimulate, this country's economic needs in the future as fruitfully as in the past. In fact, the patent system must do more than just grow *with* the country—it must stimulate future growth. The next one-hundred and twenty-five years must be as productive, as stimulated, and therefore as exciting as the last one-hundred and twenty-five. The Patent Office has a job to do. It must administer the Patent Act of 1836 so as to continue to stimulate the creative genius of inventors. When that is done, and I am confident it will be done, we may continue to enjoy the full, productive, abundant life we now enjoy. To ourselves we must re-dedicate the Patent Act of 1836 to provide at least another one-hundred twenty-five years of progress—progress which will lead to a more healthful, pleasurable, productive life. To our friends and neighbors throughout the world we also must re-dedicate the Patent Act of 1836. In our present position of world leadership, it is our duty as well as our privilege to lead our friends and neighbors throughout the world to a better life for them. Through the patent system, we are confident of further stimulating research and progress in the scientific fields. Through the development of new metal alloys, new machinery and industrial processes, new constructive leisure time devices, even new worlds in space, we hope to bring a better life to all people. As in the past, this new and better life can be promoted by the application of the Patent Act of 1836 we celebrate today.

Thomas Jefferson said "the issue of patents for new discoveries has given a spring to invention beyond my conception". How surprised and gratified Mr. Jefferson would be today to look back over one-hundred and twenty-five years and see the progress engendered by the Patent Act of 1836. I believe that with application to the problems that face

us, the next one-hundred and twenty-five years will be equally gratifying.

Chairman Gareau: Thank you Under Secretary Gudeman, for your stimulating remarks. There is no doubt that our discussions in the next few days will bring some answers to the issues which you have raised. Not only are we celebrating the 125th Anniversary of the present examination system for the grant of patents, but we are also celebrating the establishment of the Patent Office itself as a separate and distinct agency. Therefore, it was felt a visual review of the Patent Office and the operation of the patent system would be appropriate at this time. This review has been made available to us through the cooperation of The Patent, Trademark and Copyright Foundation of The George Washington University, which is, as you know, a fact-finding body pertaining to patents, trademarks, and copyrights. It is a pleasure to present at this time the Director of the Foundation, the Provost and Dean of Faculties of The George Washington University, Provost Colclough.

Provost Colclough: Thank you, Mr. Chairman. Under Secretary Gudeman, Commissioner Ladd, Mr. Larson, distinguished guests from home and abroad, ladies and gentlemen, it is with a certain sense of satisfaction that we present to you on this memorable occasion the first film produced under the supervision of The Patent, Trademark and Copyright Foundation. This is, as you know, and very fittingly so, the premier and I have been asked to tell you how the film originated. First, by way of background, I should tell you very briefly what the Foundation is and what it is doing. The Foundation—in operation since 1954—is an integral part of The George Washington University and is devoted to factual research and to education in the fields of the patent, trademark and related systems. It has an advisory council of distinguished men from various fields to advise on policy and on the formulation and carrying out of the work of the program. The Honorable Robert C. Watson is Chairman of that Council. The Foundation has a director and an executive director who, in general, elaborate and translate into concrete terms the character of the Foundation as set forth in the Declaration of Trust adopted by the Board of Trustees of the University, and it has a research staff of highly qualified men from various disciplines specialities. Area committees have been established in the major metropolitan cities of the United States for the purpose of assisting in the Foundation's work and soliciting members. Our research, from the beginning, has been based upon a plan of going to the laboratories, to the factories, to the business executives, to the professionals—yes, to all segments of our society in search of the facts. Only in that way, we believe, can knowledge of the system be effectively and intelligently related to the practical problems of those concerned. Having obtained the facts, they must be scientifically analyzed and evaluated. Then, and only then, can valid conclusions be drawn concerning the functioning of the patent and related systems in our economy. Thereafter, we are faced with a duty of making the results of our research usefully available. This task can be broadly characterized as the field of education and the basic element of education is, of course, the art of communication. Up to now, our results have been communicated in a number of ways:

1. "The Patent, Trademark and Copyright Journal of Research and Education." Herein are presented the results of our research. Also presented are articles contributed by persons knowledgeable in various theoretical or practical areas. This is the cornerstone of our communication system. It is published five times a year.
2. The Annual Public Conference which has provided an opportunity for the presentation and discussion of the research findings of the Foundation.
3. Periodic reports to members concerning the general activities of the Foundation, a copy of which I believe is in the materials that you received at the door.
4. A series of guides to Foundation research which we disseminate for busy executives entitled, "What Do You Know About – –?" and educational booklets for young people, a series of them entitled, "The Patent System All Around You."

It is our purpose to promote education of the general public, as well as those with the special interests of business, industry, the sciences, and the professions with respect to the functioning of the patent and related systems. The need to reach the public through motion picture and television we have long recognized; however, in view of our modest finances it was thought advisable first to concentrate on other media of communication. As a result of the progress we had made with the other media, it was decided that we were now ready to

offer a motion picture and to seek funds which would justify undertaking such a project. This took some time and effort but due to the enthusiastic support and the generous contributions we have received from a number of members, we have been able to produce a movie as a new segment of our communication effort. The purpose of this film is to provide a clear and memorable impression of what our patent system is, how it came to be, why it is important, and what it means to the individual citizen. It is intended to illustrate vividly that this nation's unprecedented progress and prosperity took place under the American Patent System. We believe that this medium will provide a broader understanding of the patent system and, ladies and gentlemen, I do not have to tell an audience such as this that under our form of Government, social systems, economic systems, and institutions depend upon the will of the American people; and that will, to be effectively expressed, must be an informed will. In addition to general and educational television showings throughout the country, this film will be distributed to schools, science fairs, civic clubs, company employees, and professional organizations.

We think this is a vital educational enterprise. We look upon this as a worthy prototype of a new area of educational activity. We hope that you will agree. And now—FUEL TO THE FIRE.

(The meeting adjourned at 11:30 A.M.)

Reception and Luncheon

Wednesday Afternoon, October 18, 1961

A Reception and Luncheon was held at the Washington Hotel at 12:30 P.M., under the auspices of the National Association of Manufacturers, Mr. Edward J. Dwyer, Chairman, Committee on Patents, presiding. Mr. Dwyer introduced the Honorable Emilio Q. Daddario, Congressman from Connecticut and Chairman of Subcommittee on Patents, Committee on Science and Astronautics, House of Representatives.

Honorable Emilio Q. Daddario: Thank you for the opportunity to speak on the subject of patent policies, with particular reference to inventions and space exploration. My work as chairman of the special subcommittee investigating the impact of the patent provision of the Space Act has given me considerable interest and concern about this area, and I want to share with you today some of my thoughts and some of the questions on the important issues involved.

The patent issue is not one over which political heat can be generated. It is a field for specialists. In a Congress boasting of many lawyers not one is a patent attorney. Yet it includes within itself important fundamental principles which must be carefully considered in a day when basic research is spreading out in all directions and where the Government finds itself working with the business community more than ever before. As a matter of historical importance, I think it appropriate as we mark the 125th anniversary of the American Patent Incentive System to note some of the reasons why my Congressional District is naturally interested in patent provisions.

Five commissioners of the Patent Office have been Connecticut men. Three were from my Congressional District, including the first, Henry L. Ellsworth of South Windsor, while another was descended from the founders of Hartford, which is the principal city of Connecticut. I was particularly struck by the qualifications of the first Commissioner, Henry L. Ellsworth. Descendant of George Washington's Chief justice, and twin brother of a Governor of Connecticut, Henry Ellsworth had been mayor of Hartford and president of the Aetna Life Insurance Company before he accepted Andrew Jackson's invitation to Washington. He was the last superintendent of the old Patent Office, in 1835, and the first one to administer the Office efficiently according to the official history. He was chosen to become the first Commissioner of Patents.

Much of his work in those days was concerned with agriculture, and he visited ten states one year to report on crops. He persuaded Congress to vote its first appropriation in support of agriculture—although there are some today who might wonder if this is a dubious distinction—and he was instrumental in securing a Government grant in support of the research of Samuel F. B. Morse on a telegraph.

I marveled at the unusual attainments of Mr. Ellsworth when I read of them and I contrasted the days of his greatness with those of today. One hundred and twenty-five years have elapsed, and it would be extraordinary today if a man could combine the talents of an insurance company president, mayor of a city and administrator of a Government department. It is, in a way, symbolic of the change that has occurred in this country when we think of the specialized years of training a man must undergo in reaching the top in any of these fields today.

He took office at the beginning of this country's industrial revolution. The Patent Office, as it was administered then and in the subsequent years, was a potent instrument as we reached for national goals and objectives, the development of new skills and abilities, the achievement of great economic standards. One-hundred and twenty-five years have passed and we have now come to a point in our patent incentive system where we must determine how it can help us best in the attainment of our objectives for the future. In this time of crisis and conflict individual endeavor can be submerged for what appears to be the common good. Yet it is individual talent which forces accomplishment and which brought together under our system, has made it so successful for such a long time.

As member of the House Committee on Science and Astronutics, I am especially aware of the promise which science holds for us. How we master and manage our resources, how we adapt to the scientific and technological change that is ceaselessly pressing upon us, may well determine our future and the future of the world. The accelerating rate of scientific accomplishment forces us to refine and improve the processes through which we recognize important developments. As a legislator I feel a responsibility in translating basic research to applied research and finally into development.

Perhaps the most important example of this problem was the harnessing of atomic energy. It was a wartime discovery, spurred by wartime necessity. It was born in secrecy and it offered such tremendous destructive power that we hesitated at its control. We imposed tremendous restrictions upon its further development, and, in particular, rigid control of the patents which might develop from inventions developed under this program. Not until nine years thereafter did we sufficiently feel assured of understanding its potential to modify somewhat its patent provisions.

In this argument was the kernel of one problem which has grown up about our space program. A capacity for atomic energy had developed from military causes, but we hastened to dedicate our efforts to the peaceful pursuits of its benefits. Our space program results similarly from military causes, on the rocket and missile programs in this country, and in other countries. But in the United States we have directed it to peaceful ends, and in our desire to avoid military connotations. we have, in a sense, developed a misunderstanding of what we are trying to do.

The space program—the exploration of outer space—offers one of the greatest challenges ever to confront any generation. We have in our hands the power to launch man into space. The first step will be short—two hundred fifty thousand miles or so to the moon and from there to Mars and Venus—with the entire universe at his feet, and perhaps encounters with other intelligent beings. But if we are to do so wisely, we must know what we intend to accomplish by that exploration. We must critically assess the means we have to reach our goal. We must marshal the resources and talents available to us in this country to make the most efficient use of them. In fact, the Space Act of 1958 imposes by legislation the obligation to use all our scientific personnel, facilities and skills wherever located as we apply ourselves to the use of space for peaceful purposes. We cannot impose artificial limitations upon ourselves, such as establishing separate military and civilian programs which do not work together. We cannot hobble the inventive power of our industry. We must encourage initiative and the useful contributions that all in the free world can make. I have said outer space is a great challenge. It is one that will be met best if we call upon the scientific skills and abilities that are everywhere available in government and out in civilian and military institutions and in industry.

Fundamentally, the exploration of space is not just a matter of national prestige. It also offers great opportunity to the individual. The enhancement of man's knowledge of his environment, of his use of the materials and abilities at his disposal will be some of the significant benefits derived from this massive program. This is in the forefront of our thinking.

If we are to keep the opportunity for individuals alive, we must encourage their initiative. We must see that such initiative is nourished by the possibility of reward. We must recognize that we stand to learn much. Our life sciences program is aimed at preparing man for the stresses and strains he will undergo as he is prepared for space travel. On the other hand, it also opens up great potential in the field of mental health, disease of the heart and respiratory ailments. The great issue of world disarmament cannot be separated from a space satellite which will give us eyes to see everyone on earth. Weather, its interpretation and eventually its control to the benefit of mankind, is also involved.

All this activity in space has again raised basic differences of opinion among elements of the government, industry, and the Patent Bar. Should the government take title to inventions resulting from government contract or as a result of government financing—or is a free license enough to develop the new technology involved? The fundamental premise that the government pays and therefore the government should own has resulted in a statutory obligation for NASA to take title. This is in direct contrast to the DOD position of regulation where it retains an irrevocable, nonexclusive, nontransferable, and royalty free license. A close examination of the background involved must incline over to the DOD position. The fundamental premise that the government pays is one which has been taken too much for granted. In most cases the government does not involve itself with an industry or an individual unless a proven competence has been shown. The government comes in after the idea has been conceived, after the work has been commenced, after a research team has been brought together by private capital.

It is a curious thing that during the last session of Congress a resolution was passed commemorating the 125th Anniversary of our patent system, a system which has provided one of the greatest of all incentives to Americans to interpret, to invent, and to advance the technological capacity of the United States. This we have done on one hand. On the other hand we have seen the insertion of patent clauses in all recent research legislation, the only effect of which can be to retard the interest of American enterprise to invent—and particularly to deter small business from entering into research contracts with the government. Such a clause was passed last year in the Coal Research Act. It has been placed this year in the Marine Sciences and Research Act, which pends now before the Merchant Marine and Fisheries Committee. It was incorporated into the Saline Water Conversion Act and agreed to by House conferees. It was corrected in conference in the Arms Control and Disarmament Bill. The particular clause in question has never been recommended by the Judiciary Committee of either house. It has never been debated by the House of Representatives and has only been casually discussed in the Senate. Yet it has habitually been incorporated through mere committee processes in the Senate.

Now, there is no question in my mind but that a systematic effort to incorporate restrictive patent clauses in all research legislation regardless of objectives, represents a serious threat to a patent system which has been extremely valuable to the United States for a good many years. This is a very serious problem and the solution to it certainly does not lie in a piecemeal effort to throw all inventions in connection with federal research into one grab bag. We are deluding ourselves if we go on such an assumption, for the net result is that of a boomerang—we only hamper the research we try to buy.

The best evidence on the subject is being obtained by the Subcommittee on Patents of the House Committee on Science and Astronautics. That Committee will complete its hearings during the first week of December and will then prepare a report. The indication is that one of the recommendations will be similar to that made in a report submitted last year. This recommendation will allow the director of NASA to have sufficient flexibility of choice so that he may decide when and under what circumstances he should take title to inventions. No case has yet been made that such title in the government is necessary excepting in those extreme cases where the public interest is so intrinsically involved.

Opening of Industrial Exhibit

Wednesday Afternoon, October 18, 1961

The formal opening of the Industrial Patent Exhibit was held in the Lobby of the U.S. Department of Commerce at 2:30 P.M., the Honorable David L. Ladd, Commissioner of Patents, presiding. Commissioner Ladd introduced the Honorable Hickman Price, Jr., Assistant Secretary of Commerce for Domestic Affairs.

Honorable Hickman Price, Jr.: This morning, Secretary Gudeman on behalf of Secretary Hodges, welcomed you to the celebration of the 125th Anniversary of the American Patent System. I join in this greeting for my staff and myself—wishing you a most profitable six days.

I extend a special welcome and the sincere thanks of the Department of Commerce and the Patent Office to the businessmen here whose firms made this fine exhibit possible. We are most grateful for their cooperation. We hope they will join with us in future exhibits of this kind, and we extend this invitation to you other businessmen who have come to Washington to join in this observance.

I share with Secretary Gudeman his pleasure that so many delegates from abroad have joined in this celebration. It is our honor and pleasure to have you gentlemen with us, and we plan to make your visit a pleasant, interesting and informative one. The exchange of ideas in the next six days should be fruitful—and we'll all be the richer for this exchange.

I will be watching these events very closely because of the direct bearing any discussion on patents has on our economic and technological growth. For this reason, I am delighted to be with you this afternoon to officially open this Patent Office Exhibit.

I know that what you will have to say in your deliberations and in your meetings and seminars this week and next week, will be meaningful and helpful. But many of these discussions, by their very nature are highly specialized and technical. Few besides those who work in the patent profession will grasp the importance and significance of your discussions. It takes an exhibit such as this one around us today to drive home dramatically the meaning of the patent system for everyone to understand. Here, this exhibit tells us something about the patent system that everyone can grasp. Here we see how this system has played its certain and stimulating role in American industry. What we see here is a score of examples of firms that clearly trace their development to the incentives offered in the patents they hold and prize.

It is encouraging—indeed gratifying—to see these many firms join with their government in conveying to the American people the importance of patents. This government-industry team, has set out to show the general public in the next 30 days a story of research and progress as of 1961, and the relation of that research and progress to science, industry, invention and patents. It is apparent from what we see here, that this government-industry team will achieve its goals.

When I look around this hall and see these many fine electronics and electrical firms, and see so many familiar trademarks, I am compelled to note that here is another of the frequent instances of government-industry cooperation. It makes me wonder what gives rise to the comments we sometimes hear these days that this is an anti-business administration.

Here we are meeting in the key department of government which has American business as its major concern. Certainly this is apparent in this Patent Office Exhibit.

We need but to walk a few feet from this lobby to see other agencies of the Department of Commerce hard at work at their business of foreign and domestic commerce, working on matters pertaining to weather, transportation, standards, census and myriad other tasks relating directly to American business and industry. Clearly, then, ours is the business of business.

The business at hand here today is that of the Patent Office. The businessmen here today would agree with me if I said that most of these products shown here would never have been manufactured had it not been for the patent system. Had it not been for the patent system, ours would have been an economy of secrecy, distrust and confusion. Without the incentives offered in a patent grant, few men would have been encouraged to invent; men would not have invested in new devices and new products, and the few inventors would not have disclosed the nature of their inventions. The vast treasure of applied technological and scientific knowledge now contained in the more than 3,000,000 patents in this building, and available to the public, would never have been amassed. Men would not have had the knowledge from which to innovate and improvise; nor would they have had the information on which the growth and the well-being of men are based.

We must marvel at the wisdom of our forefathers who gave us this system. The patent system has existed since 1790, and was re-established by the Patent Act of 1836, an act setting up an examination system for patent applications and establishing the Patent Office as a separate and distinct agency in the State Department. The Patent Office is now—and more properly so—an integral part of the Department of Commerce. Yet it is interesting to note that the Patent Office predates the Department of Commerce by more than a century. This was clearly a case of putting the horse before the cart. Commerce should come only after industry began, and industry came from the creative and inventive genius of Americans. This genius flourished under the patent system; and as a consequence our economy flourished. We were transformed from a nation of farmers to a great industrial economy.

Industry continues to flourish under this system. Billions are set aside each year by American firms for research and development. There is a constant flow of new products to the market. Every day we see new trademarks. There are trademarks on these panels that did not exist ten, five, or even one year ago.

The number of new trademark registrations issued by the Patent Office is one of the positive indices of continued economic growth. The more than 27,000 trademarks which are registered each year tell us certainly that more new products are on their way to the market place. But the most meaningful index of continued economic growth is the number of patent applications. More than 83,000 requests for patents in fiscal 1961—the largest number in the last 30 years—certainly tell us that there is great activity in the research laboratories of American industry.

Every day more than 300 applications for patents arrive in this building. American creative and inventive genius is not dead. Indeed not! It is livelier, more vibrant, more imaginative than ever. Now there are more patent applications in a single day than the entire year of 1836 when the Patent Act was passed.

It staggers the mind to review some of the recent patents; some far too complex for most of us to understand; some seemingly fantastic and out of this world. The entire area of nuclear energy for peaceful uses has opened new vistas to man. Patents have been issued on a wheelless automobile that travels a few inches above the ground. Patents have been issued on inertial guidance systems; on plastics; on tranquilizers; on powerful antibiotics; on color television; on silicones; on data processing equipment; on synthetic rubber having all the qualities of natural rubber; on synthetic fabrics and fibers; on helicopters and flying platforms. The list is long. Certainly it must be, considering that more than a thousand patents for novel and useful inventions are issued from this building each week.

It is no ordinary system that can issue 1000 patents each week. It is no ordinary system that offers the incentive to invent, invest and disclose. It is no ordinary system that is the stimulus to American technological and economic growth. It is a system which characterizes the nature of American free enterprise. It is a system that clearly illustrates the concern of government for the intrinsic rights of its inventors, investors and manufacturers. The result is that the Patent Office has paralleled the growth of the United States.

It is appropriate then that we mark this week as The American Patent System Week and that we commemorate the 125th Anniversary of the passage of the Patent Act of 1836. These are not dates

which are apt to appear in our history books or on calendars of important events. These are dates which have been obscured by the magnitude of the events they launched. Three million patents will linger longer in our minds than the passage of the Patent Act of 1836.

It is important, therefore, that we assemble here for this celebration if only to remind ourselves of what we have in the patent system—that we not take it for granted. The educators, scientists, industrialists, lawyers and businessmen who have come here to mark this auspicious occasion can do so comfortable in the knowledge that the Department of Commerce does not and will not take the Patent Office for granted. It is a system that served the United States well, that must serve the United States better, and therefore a system that must be strengthened if it is to serve the United States better. This is what Secretary Hodges had in mind when he told the Congress last spring: "This administration intends to strengthen the patent system and to improve wherever possible Patent Office services to inventor, business and industry, and the general public." I expect that these days of discussion will make some notable contributions to this strengthening. Thank you.

Second Session

Wednesday Afternoon, October 18, 1961

The second session of the Celebration was called to order at 3:30 P.M., in the Departmental Auditorium by Honorable Horace B. Fay, Jr., Assistant Commissioner of Patents.

Assistant Commissioner Fay: Ladies and Gentlemen. Commissioner Ladd has been delayed by the ceremonies at the Industrial Patent Exhibit. In the interest of time, it is necessary to proceed with this session. I would like to introduce to you the Moderator for this afternoon's program, Mr. Edward J. Dwyer, President of The Electric Storage Battery Company. He will introduce the members of the panel. Mr. Dwyer.

Mr. Dwyer: Thank you very much, Mr. Fay. Ladies and gentlemen, and, once again, our honored guests from home and abroad, it is a great privilege for the National Association of Manufacturers to take an active part in commemorating the 125th Anniversary of our modern patent system and the three millionth patent issued last month. It is particularly fitting for the National Association of Manufacturers to conduct this panel discussion on the subject of Industrial Progress through Patents. As you all know, the Association is composed of many members, most of whom are small manufacturers with a deep interest in the patent system and a strong reliance on patents for their progress. Those who are not small manufacturers also place great reliance on patents because their growth has been achieved primarily as a result of the patent system and the incentives provided by patent protection. When we talk about incentives of patents, we talk about three kinds of incentives:

1. The incentive to engage in research and development;
2. The incentive to disclose, because by disclosure, we get that feeding of other people, which produces more developments, and
3. The incentive to invent.

We have with us today five gentlemen who have volunteered to take part in this panel to tell what patents have done for the progress of their respective companies or industries, and what patents have done for them individually. This is a panel discussion. We shall have a brief talk from each of the panelists; and then, at the end of the discussion, the panelists are ready and willing, and I might even say anxious, to answer any questions from this audience to help the panel develop more fully the importance of patents to industrial progress.

I am not going to introduce all of the panelists at this time. I think that it would be better to introduce each panelist as he is about to speak. I shall therefore proceed to the first speaker.

He is Rudy Bannow who is Chairman of the Board of the National Association of Manufacturers and also President of Bridgeport Machine Company of Bridgeport, Connecticut. Rudy is an interesting person. He was born in Goteberg, Sweden, where he attended public schools. He came to the United States in 1910 at the age of thirteen. He entered the pattern-making trade in Massachusetts and then went into business for himself in the Bridgeport Pattern Model Works in Bridgeport, Connecticut. He has been in the business of manufacturing high-speed milling equipment and complete milling machines. Mr. Bannow has been active in National Association of Manufacturers for many years—as a matter of fact he was my predecessor on this Patents Committee, and he is now the Association's Chairman. I think that one other significant fact should be noted for our overseas friends who are with us. Last year Sweden's King Gustavus Adolphus VI recognized the accomplishments of Mr. Bannow and bestowed upon him the

Royal Order of Vasa. Rudy, would you like to lead off our panelists?

Mr. Bannow: Thank you, Mr. Dwyer. First, let me say that up to the age of thirteen, I spoke no English. We have several Swedish and Norwegian friends with us today and maybe we should take this part of the discussion in the Scandinavian language so that we understand each other better. When we speak of the value of patents and what they contribute to our economy, let me give you several examples in my local community—Bridgeport, Connecticut.

In Seaside Park in Bridgeport, there are two statutes—one to the donor of the Park, Mr. P. T. Barnum of circus fame, but the central figure in the Park is Elias Howe, the inventor of the sewing machine. We all know how this invention has contributed to the general welfare of the American housewife and of the textile industry in general.

Another person of note in our city is a man named Ray. When the automobile first came into existence, several companies were established in Bridgeport, but every automobile, no matter where it was built, needed brakes. Mr. Ray combined asbestos and copper wire in a particular way and the Raybestos brake lining was created. He has contributed to employment and progress for many years. An instrument of importance to tool makers is the micrometer. It has become an international tool—yet the first one was made at the Bridgeport Brass Company for gauging the thickness of brass.

These inventors built the communities—they built the towns. They were practically responsible for a city like Bridgeport and cities all over the United States. After the inventors had worked and developed and had the protection that made it possible for them to risk and go into production for what they hoped would work, they built the towns and the communities. I don't think we were quite fair when so often we labeled them "robber barons" after they had done this terrific job in building the convenient way of living which we have in America. Every Y. M. C. A., every Boy's Club, everything we have for our youth can be traced to these inventors and developers. I think we can afford to straighten out our past history on the inventor.

Now, in our own little effort in the Bridgeport Machine Company which started with a savings of some $80 and a loan of $3,000, we have furnished employment now for some 450 people. I also find that about 5,000 people are dependent upon the activities of my Company, and of course it is based on the fact that I had an idea.

It was not a matter of a big research organization. It was the simple case of an individual who suddenly decided that there could be a different design on a milling machine. So the Bridgeport Milling Machine was born on a shipping pad where I sketched my idea for which the United States Patent Office eventually gave me protection. This incentive to invent, to create, and to build has created the jobs which are the important things for people. While the inventor has had the benefit of Government protection of their ideas until they can exploit them, the inventor and manufacturer in turn can do a job for the Government and for the people. This is the marvelous positive contribution of American industry, and none of it would be possible without our Patent System. Thank you.

Mr. Dwyer: Our next panelist is Donald L. Brown, who is Vice-President and Director of a company that has a sensational name today because of the progress that it has made, and Mr. Brown, is here to tell that story. The company is the Polaroid Corporation of Cambridge, Massachusetts. Mr. Brown, like many other business men, has a legal background. He practiced law in New York before assuming responsibility for Polaroid's patent activities. I know he has an interesting story to tell. Mr. Brown.

Mr. Brown: I think perhaps that Polaroid Corporation is one of the few companies which seems to have been hand-tailored to fit the patent system, or vice-versa, the patent system was hand-tailored to fit the Polaroid corporation. This company is essentially the child of one man, Edwin Land, who is now President and Chairman of the Board, Director of Research, and principal stockholder of the company. He is fifty-two years old. The growth of the company has been most rapid in the past twelve or thirteen years. It now, I think, would be classified as a large corporation. It does $100,000,000 business a year. It employs some 2600–2700 people. It has a research and design engineering group of about 300. In our Patent Department we have twelve attorneys and a comparable clerical staff. All of this has grown from literally nothing, and all of it is literally dependent upon patents. I may give you some idea as to the value we place upon patents by saying that

we now hold approximately 525 United States patents and approximately 1,000 foreign patents in some 26 or 28 countries. We are filing patent applications at the rate of about one hundred a year. Now, how did this develop? In 1927, Dr. Land was a high school senior. He got an idea for a new kind of polarizing material—a suspension of oriented crystals in a plastic sheet. This product had the optical properties of the crystal and the physical properties of the plastic, and, so far as I know, it was the first product of this kind to have been developed. From 1927 until 1934, Land worked alone or with two or three assistants in a basement laboratory across the street from the Back Bay Station in Albany—if any of you gentlemen know that district, the building is now a rooming house. The laboratory was a room about 20 X 30 feet. Every time a train went by every solution in every pot was jarred and jiggled. It wasn't a good place to work. In 1934 we got our first patent, which was a fairly broad patent covering the polarizing material, and with that protection we marketed a sheet-polarizing material. We granted a license to Eastman Kodak Company in the photographic filter field. We granted the following year a license to American Optical Company for sun glasses and we began to make and sell a product. By 1936 we had a small but profitable business and then we sought financial assistance. The first question that was asked us, and the question that has been invariably asked us since, is, "What about the patent protection?" Our patent picture by that time had expanded until we had about nine or ten patents. Investigation satisfied the financial group that the patent structure was sound. We were able to finance a corporation on a basis which left voting stock control with the inventor, and which gave the new corporation adequate financial backing to enlarge its research, increase its manufacturing equipment, and market a larger volume of polarizing material. The business grew until the war years, 1941, when the company had expanded considerably. We then threw the entire effort of the company into research for the military department and this continued for a matter of some three years. In 1944–45 Dr. Land became satisfied that the company needed a new product and he sat down and deliberately invented—I mean that—without any experimental prior work he intellectually conceived and worked out the picture-in-a-minute camera and process, which has formed the basis for the company's expanded business. In fact, he worked out seven different processes for producing a picture in a minute and selected the one which ultimately became commercialized as the most likely. We immediately filed patent applications, and here again, our first patents in this field issued in 1948, contemporaneously with the introduction of the camera and film commercially. That development has resulted in some 250 patents, in an expanded technology, and in the production of photographic film which has an ASA rating of 3,000, which means that you can take snapshots in a room of this kind without any flash bulbs under these lighting conditions. Laboratory film has speed in the order of 30,000 ASA. In fact, it is so responsive to light as to make it impossible to use the film in an ordinary camera because of light leaks. It is being used in connection with the photographing of oscilloscope traces. Cameras have been produced in quantities greatly in excess of the industry's prior estimate. We are now selling these cameras at the rate of about 800,000 a year. The film is being produced at the rate of about 3,000,000 rolls a month. The field is expanding rapidly into allied fields—X-ray and other fields. All of these products—with the exception of the case in which the camera is packaged—every product including the cardboard box in which the film is sold, is patented. We sell no products except those which have been protected by our own patents and as a result, we had no competition whatever in the field of picture-in-a-minute photography, and it wasn't until some twelve years after the introduction of the polarizer that there was any competition in that field.

No, I don't think it is necessary for me to say anything more so far as the corporate outlook with respect to the value of patents. We have found, however, during the development of the company that the fact that we had a patent picture gave us certain advantages which we had not previously contemplated. We entered the photographic field from scratch. This was a fairly highly developed field and I don't have to tell you that there were strong companies and there was very healthy potential competition in the field. We found, however, that because we had a strong patent picture we were able to sit down and negotiate with companies that competitively were far ahead of us. We were able to work out cooperative research programs in which both companies, we and our competitor, or our cooperative company, relied upon their patent structure for protection.

We found that with this reliance we were able to progress rapidly, to pool technologies, to release for

publication material which would otherwise have been kept secret and to advance the technology of the entire industry at a much more rapid rate than we could otherwise have done. We have found this not only in the field of photography, we have found it in connection with research in other fields. There was recently announced a new development which we have been working on in the electric light field where we have developed a lamp involving a tantalum carbide filament that seems to have certain advantages. Here again we were able to work out cooperative research programs based upon reliance upon patents which we could not otherwise have done. I would like to mention one other aspect of this patent picture which seems to me important, that is the fact that as the company grows—as we have grown—it receives from outside inventors and from people who are interested in the same field many ideas and it is subjected to the danger that an idea may be submitted to it which, through some lack of communication, may later be adopted and used by some of its departments and it may then be subjected to a suit for misappropriation of an idea submitted in confidence. As a result, such companies as Polaroid Corporation I think invariably adopt as a matter of company policy that they will not entertain any idea that is submitted to them. We refuse to listen to it unless the person submitting it either signs a release or says that he has patent protection and is submitting the idea with no idea that it is under any confidential relationship. Here the fact that there is a patent structure, the fact that the individual who submits the idea can file a patent application and rely upon it to establish his date of invention, gives him an opportunity to submit the proposal and gives the company receiving the idea an opportunity to investigate it, to consider it, which he would not otherwise have. Thus, patents from my standpoint have been very valuable—not only to the inventor who has built his company from scratch behind the protection granted by the patent laws but also to that company after it has been built. The patent structure has proved an advantage, enabling it to negotiate with the individual outside inventor who submits his idea and has no way of protecting himself except as he may file a patent application first and rely upon that protection. Thank you.

Mr. Dwyer: Thank you very much, Mr. Brown, for a fascinating story. I think you will observe that the first two speakers we had are men talking about individual inventors and their progress through the benefits and the incentives of the patent system. Our next speaker is in a somewhat similar position. He is Mr. Morgan Parker, President of the Bard-Parker Company and an inventor of the Bard-Parker surgical knife. He has had many activities besides those of inventing and the founding and operation of his business. We are proud of the fact that he actively supports the activities of the NAM Patents Committee and supports its efforts with his counsel. Mr. Parker.

Mr. Parker: Gentlemen, I don't know whether I ought to be classed as an inventor. You might say that I have done some developing and I make a distinction. I think the experience of my Company and myself is very similar to the experience of the two gentlemen who have just spoken before me. I would regard the American Patent System, as we know it in this country, as probably the greatest single incentive to creation and development, and I believe it is perhaps the most important single factor, economically, in the very amazing technological growth of this country. If we look over the years to see what has happened here in America, I think we can all be extraordinarily proud of the work—the accomplishment—that has come out of giving this incentive.

It has very often been said that the patent is a certain monopoly and prohibits competition. I take the position that it does precisely the opposite. Speaking from personal experience, but I think it will be universal, certain ideas have been presented to me that looked as though they might be an improvement on preceding developments but not to an extent which would permit the granting of a patent. Where the cost of developing that new item would be very great, I have maintained the monopoly of that idea by saying nothing about it and doing nothing with it. In that way I have not raised competition. I have maintained that monopoly. When a patent is obtained, however, I find that I will be protected from having other people get the benefit of the cost that I have incurred to develop that article and then go into business against me before I have had an opportunity to recover my expenses. That kind of situation has occurred a good many times. Now if I can get the insurance of not having other people imitate me, at my expense, for a sufficient length of time to enable me to recover the costs and certain benefits, then I am perfectly willing to give up that monopoly, if you want to call it that, by publishing how to produce the article in the American Patent Certificate. I

think that should be borne in mind. It is not in any sense a monopoly. It is an undertaking to give up the monopoly as soon as you have been allowed the opportunity to recover costs.

I started in my business many years ago, as a mechanic, not as a surgeon, as the result of having heard the complaints of the medical profession with regard to the kinds and types of instruments that were available in those days. In 1910–12, I had relatives who were surgeons and I took the opportunity of watching surgery quite frequently. I came to the conclusion that there was room for a considerable improvement in some of their tools. At this point I want to add that I had no capital by which to go into a new enterprise to develop all these things in a limited field and certainly speculative as to the success of things of this kind. It was because I could obtain a patent that I not only went ahead with these thoughts but I was enabled to induce some others to come in with capital—small as it was—to enable these things to be developed. They did so in the belief that if these things were good, they would produce enough income to repay them, providing that as soon as they were proved they were not taken away from us by competition of superior size. Here is an illustration of where the American Patent System creates a small company and permits it to grow—the thing which is so important in our economy. I can't tell you how many men I have known who have found that same reason. I have had a good many friends who have been constructive in their thinking, who have developed their ideas, and who have found people who would support them in doing so because it was the opportunity of recovering their expenses and making something in addition.

Gentlemen, there is tremendous incentive in the American patent. One could get into a lot of technology as to the form of the law. I am going to avoid that entirely. I am not a patent attorney. I may have some rather pronounced private opinions on the subject—but this is no place to discuss the law. What I want to emphasize here is the value which can be had from a good patent—that it does not suppress competition. It means that competition will develop as the result of your having been able to produce a new line of things after a certain length of time which otherwise would never have occurred. I will give you an illustration. There probably are very few people in this room who haven't at some time in the last forty-five years, nearly fifty years, had some form of a surgical instrument used upon them. It is almost certain that had it not been for the Patent System, you would have been operated on by some of those old instruments, from which operation you might not have recovered as well as you have, and you owe your perfection directly to the development and the improvement which occurred in that kind of tool to the American Patent System. Thank you, gentlemen.

Mr. Dwyer: Thank you very much, Mr. Parker. We now seem to be moving up the scale in size of operation, and this was quite unplanned. Our next speaker is from the Ex-Cell-O Corporation. He is Mr. James K. Fulks, Executive Vice-President. Mr. Fulks is an engineer. He joined Ex-Cell-O in 1925 and has been a member of its Board of Directors since 1948. I am told he is a Past President of the American Ordnance Association and a Director of the National Machine Tool Builders Association. An interesting aspect of Mr. Fulks' company is its diversification. We are going to hear from him about a company that is in such unrelated fields as packaging, computers, and machine tools. This is covering quite a few different elements of our American economy. Mr. Fulks.

Mr. Fulks: Thank you. Ladies and gentlemen, our company, the Ex-Cell-O Corporation with headquarters in Detroit was organized in 1919 and, as Mr. Dwyer has said, I have been there for over 35 years. So you see I have been there more than three-fourths of the time the company has existed, and many of the things I am going to tell you about are things which I remember distinctly.

Our company was formed by a group of practical machinists who came out of the machine shops in the area. They were owner-managers. They worked hard. They had no product. They operated as a general machine shop and as they went along they recognized the importance and need for having a standardized product. In the very early days, we had a standardized product in drill jig bushings but this was a small item and had only a limited potential.

As a result of average business from 1919, hard work and some profit, in 1930 we were able to purchase two other machine shops. These machine shops were also without specific products, even though they had the capability of making cutting tools, jigs, fixtures, special machines. They really did not have a standardized product that could be advertised as such to the public.

The same management, having had the experience of the need, decided in 1931 that we would embark on a program of research and development to bring into being a standardized line of machine tools. They had as their objective a line of tools that were different from any then existing. They wanted something new in structural arrangement—something new in operating characteristics—something new in the processes employed.

Under the leadership of some very aggressive people, a group of men designed, built and developed prototypes, and did come up with a machine that was a hydraulically actuated machine different in structural arrangement, a hydraulic system that provided a very fine but exceedingly uniform rate of feed—and one that had a wide but infinite variable rate of feed. This machine was marketed and known at the time as the Diamond Boring Machine because it employed diamonds as the cutting tool. It machined better than had been machined before such things as connecting rods, the babbit end and crank end of a rod, the pin holes in pistons, the turning of pistons—any nonferrous metal that required a very fine finish and a very accurate dimensional tolerance. As time went on, cutting tools were improved and as carbides came into the picture, the applications of this machine were broadened and it is now known as the Ex-Cell-O Precision Boring, Facing and Turning Machine.

This development work cost a lot of money. We were a young company. But since we had approached it from something new and novel, there had been some inventions and the inventions brought patents. We applied for patents and they were issued and having the patents gave us some security. It gave us a secure feeling because in having patents on our inventions, other people could not duplicate our equipment without our granting a license for them to do so. It gave our management a feeling of confidence that their decision to go out and spend money for research and development was a good decision, and it also gave us confidence in our patent system.

Over the years it has been very interesting to me to become involved in our patent and research development work. It always seemed to me that the rules and procedures and processes in the Patent Office were pretty clearly defined and pretty straightforward. To be sure we had to hire experts to recognize inventions, to write applications, and to argue our case in court., etc.; but I always felt that the Patent Office acted purely on the facts presented or the facts as the history related it. The decision was not the result of any emotional or any personal feeling. I have been with our company long enough to have seen many other subjects in the legal category adjudicated and I cannot say that I feel the same judicious treatment prevailed in all of these. I think this is a compliment to our system and to the men who administer it.

As we went along with the production and sale of this particular machine, it provided funds by which we could continue our research and development, so we continued in the machine tool field and branched into other fields. As we did this, we often came up with inventions and made application for patents in the United States and sometimes in foreign countries. We had many patents issued in foreign countries. The fact that we were able to do this and the fact that our patents were respected had a great influence on our establishing foreign manufacturing operations.

In 1954 we started operations in England and Canada and these operations were organized to manufacture the products we had invented, patented and developed in the United States and on which we had some foreign patents. In 1958 we did the same thing in Germany. In 1959 we started a business in India. It is still small but is in the process of developing.

Now, as Mr. Bannow said, too, this system which provided an incentive for people to work hard in the way of developing things resulted in many new products for our company. It resulted in the growth of our company; it resulted in management being able to increase its employment considerably. It resulted in our being able to pay good wages, to pay the taxes that our Government levied and also to return something to the stockholder. Our product now are quite varied. We have a very broad and we think, diversified line of products—machine tools, cutting tools, precision parts, electro-mechanical devices and packaging equipment. Some of you may recognize that our Packaging Division is the one producing equipment to package milk in paper containers. A great percentage of the milk that is packaged in the United States and all over the world, for that matter, is packaged by machines that resulted from our research and development when patents were obtained.

As we went along we developed a philosophy of patents which permitted us to license others to use them, especially if in our opinion a license did some

thing for our free enterprise system. It also influenced us to purchase the patent rights from others. To give you some idea of the growth, which I think is principally the result of research and development producing inventions and patents, the first sixteen years of our business life from 1919 to 1935 (and I take this date because in 1935 we were just beginning to feel the effect of the research and development work and the income from our precision boring machine) brought us annual sales of $1,040,000 in 1935. In the next twenty-five years, our annual sales grew to $137,000,600 in 1960.

We have a high regard for our patent system, for the people who administer it, for the country we live in, and the system we operate under. I am personally fully convinced that it is necessary to spend money for research and development work and I believe that any company that is to prosper and is to grow must spend heavily in research and development. I think our patent system is good. I think it provides an incentive to spend and I certainly am convinced that it must be maintained. Thank you.

Mr. Dwyer: Thank you very much, Mr. Fulks. Our last panelist represents an industry that probably is talked about more unfairly than any other industry I know. But he is also a man who has done much to help clear the atmosphere on the problem. We are very happy to have with us Mr. Connor, President of Merck, Sharp and Dohme. He has been President and Director of that company since 1955. He received his undergraduate degree at Syracuse and his law degree at Harvard and practiced law in New York, beginning in 1939. During the war he was General Counsel of the Office of Scientific Research and Development and went with Merck shortly thereafter. He also served in the Marine Corps and later as counsel for the Office of Naval Research. Mr. Connor has many activities but I am certain that his first love is the operation of his great company, and we are very happy to have him tell us of the importance of patents to his firm and the pharamaceutical industry.

Mr. Connor: Thank you, Mr. Dwyer. Ladies and gentlemen, the story of Merck is quite similar to the story from the other speakers. Merck was a very small company in the early 1930's. At that time it was headed by George Merck, who remained as President for a span of about twenty-five years. The growth of the company is directly traceable to his faith in research and the ability to cover the results of that research with patent protection. Mr. Merck was a great humanitarian but he was also a sound businessman. When he took the large risk of setting up a research program in the early 1930's, while the depression was still on, he decided that his program would go into very basic research in the medicinal field, rather than to concentrate on development. He recognized fully that this could not be done unless that, if successful, the products emerging from that program could be covered by patents.

The company grew and is continuing to grow. Our sales in 1954 were $150,000,000. They have grown to $224,000,000 in 1960. The main reason for that continued growth has been the excellent research work done by outstanding scientists who have come up with new, valuable products from time to time.

The increase in Merck research and development expenditures is signficant. They increased from $9,650,000 in 1954 to $21,000,000 in 1960. I contrast that figure of $21,000,000, which we spent last year on research and development, with what we paid out to our stockholders in dividends during the year 1960. Our stockholders received about $17,000,000, significantly less than what we spent on research and development, and yet I received no letter of complaint from any of the 40,000 stockholders. Incidentally, you will be glad to know that as a result of the growth of our research program we now employ many more patent lawyers than we did several years ago, and of course we employ many more scientists—there are about 1,200 people engaged in our research and development activities. Many of them have under-graduate degrees. Over three hundred have graduate degrees in about thirty very specialized fields of scientific activity. We would not be able to do this, as I have said, without the incentives and the protection that is offered by the patent system.

Since I have been president, I can state from personal conviction that the presence of the patent system has been one of the main reasons why we have continued to devote more and more attention and effort to research. We think that this is not only of value to the company and its employees and stockholders, but that it has been of tremendous public benefit. Some of the drugs that have been developed in our laboratory and have proved to be valuable therapeutic agents have names that are more familiar to your doctors than they are to you because nearly all of them are available only on prescription. Some of them are fairly well known to the general public such as Diuril and Hydrodiuri, Periactin, cortisone, vitamin B–12 and several of the

other vitamins, and many other important products that we don't think would be available today unless we had the faith to go ahead with research, and knowing that, the results of research would be covered by a patent system such as we have in this country.

In addition, our company has been able to diversify in the last several years, not only from new products that have emerged from our own research program, but also because other products in other fields have been available to us in the United States under license. As one example, we are now in the ultra-pure silicon business where we are one of the competitors of Texas Instruments. This has been possible because we had a research program of our own in that field, and at an appropriate time we made a licensing arrangement with a German firm. More recently we have gone into the manufacture of monosodium glutamate, a flavor enhancing agent used in the food business on a large scale. This again was the result of a combination of our own research work and a licensing arrangement with a Japanese firm.

At the present time we have some very serious questions affecting our industry. Most of these questions arise from the patent provisions of the Kefauver-Celler Bill (S. 1552) which has been recently introduced and on which hearings are being held today. We think that the patent provisions of the Kefauver Bill would threaten this socially desirable and helpful system that I have described and it would certainly reduce research incentives. The question arises: What does the Bill offer in place of the kind of system that we have today in our industry? Its sponsors say that lower cost drugs would result in some categories. This perhaps is true, but we think that higher cost drugs would result in other categories. With the smaller production and marketing volume which would result when all 1,300 U.S. pharmaceutical firms are able to go into all product lines, it is reasonable to expect that the per-unit costs for most of those drugs would skyrocket. This effect of volume or unit costs is usually the situation that prevails in the chemical, pharmaceutical and biological fields. We don't think, therefore, that the consumer would benefit in the long run.

We see as a direct result that there would be diminished research in the pharmaceutical industry, because we just could not afford to maintain the kind of research and development program that we have today in the absence of the patent protection that we now have. We think it certain that there would be much less support of the basic research by the pharmaceutical industry because, unless adequate rewards are possible, no company can accept the very small chance of success and the heavy risk of failure. We think it is quite clear that there would be fewer new drugs of value because many of the product modifications and combinations on which we are now able to get patent protection would no longer be patentable in the Bill. Chemical structural modification is a very costly endeavor and we just would not be able to do it without the kind of protection that is now available. There would certainly be greater delay in getting patents.

I emphasize the point made by some of the earlier speakers that the kind of research work which would then be carried on, which would be more accurately described as development, would have to be carried on in secrecy because you could not afford to publish and thus let your competitors know what was going on. In many other ways there would be inhibitions in disseminating information that would make the research program more costly and new products much more difficult to introduce.

With due care and deliberation I state my opinion that this Kefauver Bill represents an attempt to communize the research results of the U.S. pharmaceutical industry. Naturally we oppose it. Thus, while we celebrate here the 125th Anniversary of the Patent Act, we may be gathering to mourn its destruction in the not too distant future. If the traditional protection of the U.S. Patent System is to be swept away from the pharmaceutical industry, is it not quite possible that the same protection can be swept aside for other industries, or for all industries, some time in the future? Don't forget, Senator Kefauver justifies his proposal in our industry by alleging that there are unreasonably high prices and high profits for our products, charges that he has yet to prove, by the way, but he has also made the same argument in the recent past that the prices and the profits in many other industries are too high—at least by his standards. He said that about steel products and bakery products, automobiles, and other industries. We think that you gentlemen who are in other industries do have an interest in this particular type of legislation. We think it undermines the whole patent system, and your products and your industries may be next. Thank you.

Mr. Dwyer: Thank you very much, Mr. Connor. We are now at the place in our program where we are ready to accept questions from the floor. I was struck by one statement that Mr. Parker made,

and I would like to get the views of the rest of the panel. Mr. Parker stated that in his opinion patents created small businesses. Rudy, what is your view on that question?

Mr. Bannow: We are a small business. Our company has reached something over 450 employees. Now when you rise to over 500 employees, then you are big business. We have an operation in California which puts us over this number but I do not emphasize it because I still want to wear my small business halo.

There is no question about the fact that during the years that I operated my pattern and model shop, inventors of all kinds came to me. I would say that when I think of all these inventors that would come in with a gleam in their eye, when they had suddenly hit something they thought they could patent, the patent did not represent merely the financial rewards they expected from it. An inventor is in competition with the rest of the world and there is a tremendous satisfaction in knowing that in competition with every other inventor and designer, you have thought of one original idea that no one else had. This is the double reward of the patent system.

Mr. Dwyer: Thank you very much, Rudy.

Question: Assuming that the patent system can be improved, would the panel suggest some specific areas for improvement—whether in the Patent Office or enforcing the patent in the courts?

Mr. Brown: I will make one suggestion. If anything can be done to speed up the decisions in the courts and to speed up the issuance of patents in the Patent Office, this would, I think, improve the system. I think that one serious trouble with the system today is that the Patent Office has not had the facility to act promptly upon applications as they are filed, nor to accelerate their prosecution through the Office. For example, after an appeal is taken to the Board of Appeals in the Patent Office, the applicant must wait two years for a hearing and then some months for a decision. This means that the protection which he might expect to get is delayed, and, on the other hand, it means that he has the opportunity, if he wished, to catch the art as it develops before his patent acutally issues. Neither of these is desirable. Once the patent has been granted and the patentee seeks to enforce his rights, unless he has a decision in his favor, which he never had in the first case, he is met with delay in the courts. In some of our districts he must wait from two to three years before he can get a trial as to the validity of his patent and in that time the infringer may very well milk all of the profit from the invention. I think that it would not require much in the way of legislation to effect improvement in this area but merely a more efficient use of the tools which are available. This is certainly true with respect to litigation. Either of these two features of our system could be improved, I think this would be a very major contribution to an effective operation of the System.

Mr. Connor: I think it is clear that this question of delay is important to American business. For my observation I think one of the problems is that the Patent Office has not received adequate appropriations to do the job intended, so that here is an area where I think perhaps interested business groups can be a greater help than has been true in persuading the Congress that this is extremely important in providing new jobs, in enabling the newer industries to grow faster. Since this Patent Office activity is very important to the economy as a whole, I think that it should get stronger Congressional support. Specifically on the point raised by Mr. Brown—we think our experience has shown that the interference procedure can be improved. I wonder if when an interference is declared, it could not be put on a completely separate and faster track from everything else because the continuing presence of an interference does interfere and even curtail your plans for going ahead with the production and marketing of the product in question.

Question: Does the patent system offer an adequate incentive to the employee-captive inventor?

Mr. Brown: I don't like that "captive inventor" expression. You have raised a very serious question, a very interesting question. One of the problems that has faced management, certainly in my company for many years, is how to reward the individual inventor within the company. He needs to be rewarded; he needs to be stimulated, not only for his own sake but for the sake of the company. We have tried many different ways. We have given him cash rewards. This did not work. We have given him status in the company. This works a little bit. We have given him increased salary dependent upon inventive productivity and this in turn works well. We finally decided to merge all of these things. First to give some cash rewards for constructive ideas but which were not patentable, for example how to save waste paper, how to handle scrap baskets so that

you might save $10 a week in a department, etc. In addition, we decided to place the whole company on a profit sharing basis and to try to sell to the organization the idea that the inventor, whoever he was, contributed to the profits of the company. This plan has worked for us. In turn, I don't know that this has anything particularly to do with the patent system except that where the inventor gets a patent, where the individual employee receives a patent, we make a public play of this. It is announced in the company weekly house organ; a little reception is given to him in his department; everybody congratulates him. This works fine. He feels good. Everybody else feels good. He knows that he has contributed to the company profits, and this system for some reason seems to work. Now I don't know whether that is an answer to your question or not, but I think it is a question that can only be answered by the individual company. I do know that the fact that a patent has been granted—the fact that he has to sign formal papers, that he is paid a nominal sum for the assignment, that a ritual is involved, all of this is effective in bolstering his own feeling of importance in the company and in giving him a position of respect so far as his fellow workers are concerned.

Mr. Connor: This is a very important question and we have gone through some of the gyrations that Mr. Brown has described. In our research program we place great emphasis on basic research and it is in that area that a patent is least likely to issue covering even a significant finding. Our research director felt that it would be unfortunate if we singled out the scientists who were working on projects and in areas where patentable inventions might be made in a way that did not recognize adequately the contributions of the scientists working in the more basic type of work, as, for example, methodology. After looking at many alternatives we have come up with an answer that is somewhat similar to what Polaroid has done, although we don't call it a profit-sharing arrangement. We have adopted in the last several years an employee savings and stock purchase program where within certain limits the company will contribute fifty cents for every dollar that the employee saves in the program. The company's fifty cents is used to purchase Merck stock. The employee's dollar is used to purchase no more than one-half Merck stock and the rest either Government bonds or diversified portfolio. This covers employees throughout the company, not just those in research, but because of the nature of our activities, we found that it was difficult to make a plan that would apply to all of the research people, much less only the inventors, and not apply to other employees such as chemical engineers who were in production and who therefore played an important role in the transition from research to the market place, or to patent lawyers who also have an important role to play. So we have adopted our stock purchase plan on a company-wide basis, and I think it is working out quite well.

Mr. Bannow: I would like to add this—I was at a dinner of a large chemical company. There were at least twenty men—all of them were research people, all of them had risen to a very high status. I know every one of them around that table had gone beyond the million mark. Now all of these men had contributed to that company, nearly all of them were strictly research people and that company had shared their success with every one of them.

Mr. Dwyer: I would take one more question, but our time is getting near the end. I would just like to thank each of the panelists for the interesting and rather generous comments they have made concerning the effect of the patent system on their own individual companies. It has been interesting to me to observe that three of our panelists classified themselves as mechanics or toolmakers, the panel includes men who are doing creative thinking about out patent system, and two men who are operating businesses that require other kinds of talents. In each case, we have the same approach that it is the patent that is involved in research. Believe me, in our company as well as in all these other companies, research is a gamble; but it is the hope of reward in the patent that gets you to the place where you say you want to add a few more people to your research activities because that is the progress that you will have tomorrow. In my view, this panel has demonstrated the wisdom of two recitals that were included in the Joint Resolution of the Congress which suggested that this week be designated as The American Patent System Week. The first of these reads as follows:

1. "Whereas the patent grant is a traditional incentive for the promotion of the progress of the useful arts, thereby contributing notably to the well-being of people everywhere,"

2. "Whereas encouragement of invention is essential to the continued economic and technological development of the Nation, particularly in the light of our international relationships and obligations."

Here today we heard these men describe how these incentives have permitted their companies to grow, and with the growth of their companies we have growth of the economy.

Thank you very much for your attention. We are delighted that you could be with us.

(The meeting adjourned at 5:00 P.M.)

Reception

Wednesday Evening, October 18, 1961

A Reception was held at the Sheraton-Carlton Hotel at 6:30 P.M. by the Department of State in honor of the Officials from foreign countries who were attending the Celebration. The Host was Honorable Edwin M. Martin, Assistant Secretary of State for Economic Affairs.

Third Session

Thursday Morning, October 19, 1961

The third session of the Celebration was called to order at 10:00 A.M. in the Departmental Auditorium by Mr. Charles F. Gareau.

Chairman Gareau: This meeting will please come to order. Mr. Moderator, ladies and gentlemen, it is a pleasure to again greet you at the second session of the 125th Anniversary Celebration. This morning the Seminar is under the general auspices of the Section of Patent, Trademark and Copyright Law of the American Bar Association and the Chamber of Commerce of the United States. We hope that the subject matter of this Seminar will be both interesting and stimulating to you.

The occasion for introducing a man comes quite often to most of us, but the opportunity of introducing one of the leaders of our profession is a noteworthy occasion. This morning it is my great privilege to present the Moderator of this Seminar—a man who is known throughout the patent profession as a leader and a giant in that profession. He is a second-generation patent attorney and is the present Chairman of the Section on Patent, Trademark, and Copyright Law of the American Bar Association. He is a man who is ever ready and willing to help in every way in any matter which pertains to patents. It is indeed a great pleasure to present to you Mr. Joseph Gray Jackson, the Moderator of this Seminar. Mr. Jackson.

Mr. Jackson: ladies and gentlemen, in this Seminar, as well as the other features of the program, we are paying honor to the patent system and we are particularly recognizing the 125th Anniversary of the Patent Act of 1836 which established our present examination system and, incidentally, by the same token, we are doing honor to more than three million inventors whose brilliant contributions have made life more wholesome and more

livable for all of us, and also at the same time, we are doing honor to thousands of faithful, competent, hard-working Patent Examiners, who bore with these three million inventors and, strictly in the line of duty, gave them a hard time where necessary to process their patent applications and to make sure that worthwhile patents were granted.

Our subject this morning is double-headed: "The Pros and Cons of (1) Patenting of Government-Owned Inventions and (2) The Exploitation of Government-Owned Patents". I feel that I am somewhat in the middle because as a Government metallurgist I saw certainly the Government side, and since that time I have seen some of the other side. This subject develops considerable heat, and we must be warned against approaching it with any degree of bias. It is easy to slip into your own pet rut without realizing it. A few years back a friend of mine, who lives in Philadelphia and who happened to grow up in Armenia, was invited to go up to Bird-in-Hand which is near Lancaster in Pennsylvania, and talk at an Amish Church about his early life in Armenia. He knew nothing about this group at all and he chose some objects that he could show to them. One was a student's lamp with the open wick that he had used as a child when he studied; another one was a pottery jug which had been used in their kitchen; and the third happened to be a shaving mug, which they had used in his home in Armenia. It meant nothing to him that he saw these people were bearded but that was no clue at all. He started his talk and he brought forth the student lamp with good results, and he brought forth the jug with good results, but when he came to the shaving mug, he was ultra vires and was thrown out literally from the church and he came back to Philadelphia before he knew what he had done that was wrong.

This type of prejudice I would not expect to find here, but I am sure that a lot of us do feel very strongly on this particular subject, and so with that preface and that warning, I am going to start with a text. The text is taken from Senator Russell B. Long, testifying before the Patent Subcommittee of the Senate Committee on the Judiciary, May 17, 1960, and if you have any doubt about the importance of the subject today, listen to this: "Patent lawyers, I think, object more strenuously than any other group to the Government protecting its own interests. If they can stir up $6,000,000,000, worth of unnecessary patent work, they undoubtedly make a lot of fees out of it. So I guess if I were a Patent lawyer I would want to be handling all the patent cases I could involving all of this fantastic amount of research every year".

Now let us see if we can get any other guide to the numerical figures that really are involved in the proposition. I have obtained through the courtesy of the Patent Office the following information about fee-free cases filed in the year 1960. These are of two categories—cases where a Government employee perhaps is doing research for one of the Government Departments and is filing an application which is filed without fee, or the case where the Government employee is given the advantage by the Government of filing without fee, and the total number was 1,550 filed in the year 1960, and by a strange coincidence, the number of patents of this caliber that came out in 1960 was 1,660, so the shrinkage was not very great or possibly there was a compensating factor. If we assume, therefore, that the cost of preparing and prosecuting each of these cases on an average might have been about $1,500, which is just my guess, this involves a total of about two and one-half million dollars in patent activity.

Now if the patents taken out by contractors are considerably more numerous than those taken out directly on the basis of Government activity, and I suspect this is true, I could assume, looking in my crystal ball, that the total amount of patent activity that we are talking about today might be somewhere in the order of twelve million dollars. This is not small change when you realize that under less fortunate circumstances that was the total budget for a year's operation of the Patent Office. Now there is one other gauge.

Assuming there might be a defensive aspect, as you will hear later on in connection with patent applications filed by the Government, through the courtesy of the Department of Justice, I have this figure for recoveries in suits against the Government in the Court of Claims for 1960. They were 2¼ million dollars. So we have these two gauges as well as the statement by Senator Long to consider on the quantitative side.

We were debating over here what man had the most distinctions, and the basis on which we were discussing it was this: I said "If the audience attacks us after this session, which one can we best throw to the wolves while the others escape?" This man nominated himself. He said "I am the one man

who is now employed by the Government, and I am sure I will be the one that will be thrown to the wolves." He is Assistant General Counsel for patents of the Atomic Energy Commission. He is an alumnus of the Manhattan District and was formerly in the field of patents in private practice. His subject is, "The Basis for Government Patenting." I now take great pleasure to present to you my friend, Roland Anderson.

Mr. Anderson: Mr. Chairman, Dr. Bush, fellow panelists, distinguished visitors, ladies and gentlemen, I am still glad to find that Joe calls me his friend.

It is indeed a pleasure for me to participate on this occasion in the Celebration of the 125th Anniversary of the 1836 Patent Act. While we members of the Patent Bar may deem that the American Patent System is one of the best, if not the best, in the world to protect inventors, industry, and the Government, we must recognize that it is not a perfect system and we who are guardians of the Patent System should always be on the alert for improvements in that System. We might, therefore, consider the view of those who may not be in accord with those of us who are members of the Patent Bar. I would like to note the fact that Mr. Jackson mentioned that 1,550 applications were filed by the Government in 1960 and some 1,660 patents issued. I think you will appreciate this is a small drop in the bucket when it comes to the number of applications filed in the Patent Office in one year, so that the argument that the Government patent prosecution in the Office burdens the backlog probably is dissipated by those figures. As to the discrepancy between the number filed and the number issued, I think it fair to say that there has been a backlog of patents because of the war years when some certain subject matter was placed in secrecy, for example, in the Commission, whereas we are filing an average of some 225 applications a year, at this time, we are having issued about 375–400 patents a year. The reason, of course, was that some subject matter was classified until 1954–55 and some of course is still classified, so we have an active program of declassification. With respect to the figure that about 2¼ million dollars last year was paid out by Government in claims and therefore would not we be better not to have any Government patent lawyers, I wonder if we could consider the fact that the Patent Departments may not devote all their time to prosecution—that irrespective of whether the Government filed a patent application, that we would have to have Government patent lawyers to defend the Government, to represent the Government in contract negotiations, investigate claims, and to handle the many other multitudinous aspects of patent work in Government.

I oftentimes have been accused of being against the Patent System because I have taken the position that statutory changes are necessary in our basic patent laws and that the Government may be justified under certain circumstances in taking more than a Government license. However, I am a strong believer in the Patent System, and I deem that whereas we have in the past always considered Government versus industry, we should do like our foreign brothers do—consider that the Government and industry are working together for a common cause for the benefit of the United States and its citizens.

Mr. Jackson referred to the fact that there is a great body of the Patent Bar which deems the Government should never get anything more than a license, and there is even a small segment of that Bar which deems the Government should not even get a license. However, fortunately this morning our concern is not with whether there should be any radical changes in the basic patent laws, or whether the Government should or should not get title or rights in inventions, but where the Government has title and rights in inventions, irrespective of how acquired, what should the Government practice be with respect to patenting of an invention, when it does have the title or substantial license rights of some nature or another in a particular invention. The second phase is the Government's exploitation of Government-owned inventions. The Moderator has suggested that I devote my time to the first subject; namely, why the Government secures a patent when it does have substantial rights in an invention.

If one believes that a patent is the best protection for an invention, then it would seem clear that the Government in filing for patents is utilizing the patent system to protect its and the public's interest in the invention. One basis, if not the fundamental one, certainly a principal basis for the Government's practice of securing patents on inventions which it owns, is the same reason that many corporations undertake securing patents on inventions they own, namely, for defensive reasons. If the Government has a patent, then there can be little question but that when the Government subsequently dedicates or grants royalty-free licenses, the public not only has the right to use the invention, but the patent

serves as a defense against others, asserting rights in the same subject matter, not only against the Government but against the public and against industry.

It has been indicated at times that publication might be as effective as patenting. However, if one is in favor of the Patent System, then it would appear that the preferment would be to secure a patent. Furthermore, a publication while constituting an absolute bar after one year is only effective with respect to what it shows and carries no doctrine of equivalents.

In addition, until the lapse of one year, which is often the critical period, it does not serve as a statutory bar, but is generally considered only evidence of conception and can be sworn back of as a publication. Therefore, by the filing of a patent application, the Government prima facie secures the benefit of the patent laws, one of which benefits is that the application constitutes a constructive reduction to practice which may be significant in the rapidly advancing technology of today and is of primary significance in connection with the prosecution of an interference if the patent is to issue to the first inventor and the Government is the owner of the rights of the first inventor. Many of the generic concepts which are embodied in patents and patent applications are not actually reduced to practice for several years and while the publication and descriptive material which is disseminated may serve as a partial defense in many instances, yet from the defensive point of view, the best protection under our present laws is the filed application, and eventually the patent.

Attention might be invited that, in the examining of patent applications, while theoretically the Patent Office is to consider all published literature as well as patented art yet as a matter of practice because of the work load, the Office Examiners do not find that they have sufficient time to examine all the foreign publications and even domestic publications. There have been proposals offered from time to time which have embraced the concept either that the records in the Government files would serve as a complete defense to an infringement action in the same way as an issued patent, or that the issuance of short patents, usually involving no prosecution but the filing of a caveat or specification and claims would serve the same purpose as a patent so far as anticipation is concerned. However, none of such types of proposals has gotten beyond the introduction in the Judiciary Committee of the Congress. The Patent Bar has generally been nonreceptive to such suggestions for one reason or another, including preferential treatment of the Government or that there would not be acceptance of the unprosecuted patent so that the patent would serve no useful purpose or that such innovations would not even expedite the issuance or reduce the Patent Office backlog.

Until some such ideas are enacted into law, the speaker deems that the best method under the existing patent statutes is for the Government to protect itself by patenting its inventions the same as the individual inventor or an industrial corporation. It might be noted that while the United States has been criticized for filing and securing patents, the speaker has heard no criticism voiced against foreign governments or foreign-owned corporations securing United States patents. The United States Government has faced claims for infringement by foreign governments and foreign government-owned corporations on domestic and foreign patents and on occasion has paid substantial royalties. This affords an additional reason for the filing by the United States Government not only of domestic, but of foreign patents to serve as a quid pro quo in connection with any inter-governmental arrangement pertaining to equipment and devices of mutual benefit to the respective governments; in fact, mutual security arrangement between the United States and other governments in military fields, specifically take cognizance of the fact that the respective governments will secure patents on inventions and accord to each other reciprocal rights. On other occasions the Government has used its port-folio of foreign patents to exchange for U.S. patents owned by foreign governments. An instance of the latter with which I am personally familiar was the 1956 exchange between the Canadian, the British, and the United States Governments on patents pertaining to the field of atomic energy.

Furthermore, in the atomic energy field, many governments are acquiring rights in inventions similar to the United States Government; therefore, as long as the foreign governments secure patents in their own countries and the United States, it would appear necessary for the United States for defensive purposes, as well as possibly offensive or affirmative purposes, to secure protection in the form of patents. While it is to be recognized that the Government files primarily for defensive reasons, there has been evidence that the United States Government may, like some foreign governments, use its Government-owned patents for

affirmative purposes. This latter will be discussed this morning by one of the other speakers. It has certainly been a privilege for me to present these views to you and I hope you will take them in the spirit in which they are intended—namely, to cultivate thinking on the idea of Government cooperating with industry. Thank you.

Mr. Jackson: Thank you, Roland. We will particularly welcome comments or discussion which any of our visitors from other countries may wish to present.

Now besides the people who are listed on the program, we have a very distinguished member of the panel who is a panelist-at-large in that he is not committed to any subject, and I take great pleasure in presenting to you the General Chairman of the Anniversary Celebration, Dr. Vannevar Bush. Will you rise, Dr. Bush? (Applause.) In case you wish to direct a question to Dr. Bush and you have difficulty spelling his name, just write "Dear Van" and he will accept it, I am sure.

These sessions today are like elimination bouts and the man who has teed off against Roland Anderson is from Kettering Country—Dayton, Ohio. He is a member of the National Inventors' Council and a former President of the American Patent Law Association. His subject is "Protection of Government Rights". I give you now with great pleasure our friend, Larry Biebel.

Mr. Biebel: Thank you, Mr. Moderator. Dr. Bush, fellow members of the panel, ladies and gentlemen, If Mr. Anderson has the *pro* of the issue, I have the *con,* and so that makes me a "con-man". I am not going to speak against something. I have in mind a recent editorial of F.B.I. Director J. Edgar Hoover in which he gave a warning to all Americans that it is what we stand for, not against, that we will be remembered by. The figures on Government research are somewhat astronomical and when we talk in terms of an estimated expenditure for 1961 of eight billion dollars, that is just a figure of speech really. We do know that it is a huge amount and that it is several times the amount which industry will spend.

In order to try to get some estimate of the amount of Government patent activity in which they hold title, I looked in the Annual Indexes for the last several years and I found a rather surprising thing. There have been about 44,000 to 45,000 patents issued each year. There have been about 1300 to 1400 issued to various Government agencies. The percentage is the surprising thing, in 1958 it was 2.84, in 1959 it was 2.83 and in 1960 it was 2.81, a very remarkable close similarity in the percentage of total patents which were issued to the Government. I do not know the reason for this. I am somewhat inclined to think that it may be a mere measure of the potential output of the man power which the various agencies have involved in this activity.

There is no doubt in my mind that Government patent protection for Government research is necessary. We have heard talk about a government technical publication, and the objection has been raised that it would be too voluminous. I think we underestimate the capacity of our Government Printing Office because I don't think they could find anything too voluminous. But that is not the answer. As Mr. Anderson has already said, it would only be an effective bar from after a year, it could not be preserved in secrecy and that is a very valuable aspect of a patent application, it could not relate back to a filing date, there is no sworn statement of originality, there is no identification of the true inventor and, perhaps most important of all, there is no chance to have it involved in an interference proceeding.

As taxpayers we are the ones who are ultimately paying this eight billion dollars in research, and I as one want to be sure that the Government gets what it is entitled to so that it will not have to go out and pay a second time to someone else who later invents it and takes out a patent and brings an action against the Government.

It is not necessary, however, in my opinion, that the Government have patents with claims on which they can go out and bring suit against industry, and I think unless the Government does take an affirmative policy to establish its patents, they are not self-establishing, as I think anyone who is in active patent practice will agree.

Now what is the answer that I propose? It is a publication patent. It would be in all respects similar to a present patent application insofar as the drawing, the description, the oath, and the prosecution are concerned. It would not have claims, at least not of the type that we are currently familiar with. It probably should include what I would call a résumé, which would merely be an indication by the inventor of where he thought the novelty existed. It would be filed and would come before the Examiner in the regular way. He would make an initial examination on formal grounds, that is, he would satisfy himself that there were no more than the

proper number of species involved, that it disclosed an operative device, that it did not include numerous different inventive fields which should not be allowed to creep into any such patent procedure. If it met these requirements, he would then send out a notice of allowance in the regular way. If it were a matter which the Government wanted to hold under a secrecy order, it could be kept there indefinitely; otherwise it would issue and at that time it would become a reference as of its application date, just as any other patent is at the present time.

It could be put into interference as a pending application by the Examiner if he felt that it was in conflict with another non-publication application, and the issue would be the claim of the other applicant. The question of interference seems to be one which concerns many people, and I recognize that there are different points of view and that there are some problems. I do not think they are insurmountable or that they are in fact too difficult, but that with some rather limited changes in our interference practice, this procedure could be followed.

The Government applicant whose application was published could then seek an interference with any other case which issued to a regular applicant at a later date. He would then copy the claims and the interference would proceed in all respects as it is now. If the decision were in favor of the Government applicant there would be a ruling and a notice in the Official Gazette to that effect. There would be no need for a regular applicant to copy the claim from the published case. It would merely be necessary for him to file an affidavit carrying his invention date back ahead of the filing date of the publication patent and it would be removed and he would go on in the normal way.

Now what are the advantages of this? In the first place, instead of having one set of Government patent people wrangling with another set in the Patent Office over some claims that are not going to be put into litigation anyway, that would be eliminated. I think there would be a considerable speeding up and it might be possible to increase this ratio of 2.8 percent up to a substantial amount and perhaps in that way to cut down on what I understand are substantial backlogs in unfiled disclosures. This particular proposal is coming up for discussion before the American Patent Law Association meeting tomorrow. I welcome any comments or criticisms and if you want to debate the more detailed phases of it, plan to come to that meeting. Thank you.

Mr. Jackson: We are going to give you, Roland, two minutes to bomb Larry's position.

Mr. Anderson: Mr. Biebel's position was one of the positions that I suggested as a possible alternative. I think it is the details of the thing that gets the Patent Bar upset and excited. The general principle which I believe many accept, with which certainly I am in hearty agreement and which I think that most patent attorneys who work in the Government or any representatives of Government who have much to do with patents would be in favor of is some way to be able to have a system under which the Government could protect itself without having to go through what is now known as a complete prosecution. I think I don't have much disagrement with Mr. Biebel and I am heartily in favor and I endorse the kind of position that he is taking. I submit to you that since he said it is coming before the session of the American Patent Law Association that you give very serious thought to it. The one thing I would say in this regard is something that I have said before. We sometimes forget in our conservatism the fact that we have in Congress representatives who are now familiar, or they deem that they are familiar, with certain aspects of the patent system and have seen certain defects therein, so that when we go before them to present our views such as this, that we be fully informed and able to answer the questions so that they will really get a complete picture.

In connection with this whole subject I would like to just throw out one figure that might show the reason for the Government's concern with respect to patents, whether the Government owns the invention or whether it has only some right. The figures during 1959, 1960, and 1961 show that the Government is spending approximately 59 to 62 per cent of every research dollar spent in the United States. This certainly is different from what it was years ago. One of the questions asked me was to give the total number of Government patents. I don't have those figures available but I have heard an estimate that it is somewhere in the neighborhood of 14,000. The United States Atomic Energy Commission at the present time holds some 2,700 patents as custodian for the United States Government.

Mr. Jackson: Now, Larry, will you deliver your dawn attack?

Mr. Biebel: It is rather hard to disagree with someone who agrees with you. I have a question here, however. Will publication of Government patent

rights relieve the problems of the Patent Office? That is a matter of opinion. I think it will. I have had discussions with various officials in the Patent Office. They do not see any great basic issue or problem here and I believe that if we can find a basis such as this publication idea it will take off some of the pressure. As you know, Mr. Ladd is rather concerned about the long-term future of what we are going to be able to do and how we are going to keep the staff in the Patent Office. I think that if this is a step in that direction, it is a very desirable one to take.

Mr. Jackson: Now we are launching the second phase of the subject, and the next speaker is a very new friend who poses a particular problem to me. His first name is H-e-l-g-e. We spent about half the time at the briefing session this morning trying to teach your Chairman to pronounce this correctly. He is treasurer of what your program calls Arthur J. Little, which is a subsidiary organized especially for the Celebration, no doubt, of Arthur D. Little, Inc. He is a member of the National Defense Committee of the National Chamber. He was a particularly effective witness before the McClellan Committee. Helge's subject is "Promotion of Government-Owned Patents". Helge Holst.

Mr. Holst: This is one part of an over-all presentation on the ownership and exploitation of inventions growing from government sponsorship. This part of the presentation is particularly concerned with exploitation. It is assumed at the outset that the Government has taken title to inventions and patents resulting from government sponsored research and development either within its own laboratories or as carried out by private contractors. Please let it be understood that in starting with the assumption that the Government owns the patents, this is a premise for the discussion which follows—it does not represent the recommendation of any of the panelists. However, in the interest of covering the assignment, it is not a part of this discussion to debate whether or not the Government should own patents, but rather if it does own them, how should these inventions be exploited.

Objective of Government Patent Exploitation

Taking for granted that the primary objective of the ownership of patents by the Government is to assure the Government itself of the right to use the inventions covered by such patents, let us examine briefly the secondary objective for ownership of patents by the Government. Since a large part of the available talents and resources of the country are devoted to research and development for the Government, there is an increasing hope that developments flowing from Government sponsorship can be made to yield benefits to the general public and in the general welfare. Such benefits presumably are most likely to be achieved if the development can be put into wide scale public use. Technical developments which do not leave the laboratory are of very little benefit. If, however, new products or new services can be made widely available, then there is the opportunity for the public to use and to enjoy such products or services and to benefit from them. The question, therefore, to which this part of the discussion is directed is—how is it most likely that government-owned patents can achieve widespread public use and distribution?

Some Discouraging Statistics

Whether we like it or not, it is a fact that a very small proportion of patents filed and prosecuted to successful issue will yield substantial return. Statistics of this kind are not easy to obtain. A study made about a year ago and published in the 1960 winter issue of the "Patent Trademark and Copyright Journal" of The George Washington University indicated: "The rate of *commercial utilization* of privately owned patented inventions originating under federally financed R & D contracts is about 13 per cent. In contrast privately developed and privately owned assigned patented inventions are *utilized* at a rate of between 55 and 65 per cent." Just what is meant by utilization is not explained. Undoubtedly, it is intended to include both production of items or services and also cross licensing or use of patents in the course of negotiation.

It would seem useful to try to determine what proportion of patents produce enough income to make them self-supporting. The statistics here are very discouraging. From three sources, we have attempted to gather data bearing on the actual yield of royalty or other income from patents. At the outset, it is worthwhile to note, as was mentioned by Chairman Jackson, that the prosecution of the average patent to issue is estimated to cost $1,500. It is likewise commonly stated that the research and development effort together with patent prosecution costs an average of $10,000. Now, of course, we all know that certain inventions such as nylon have both been expensive to develop and have produced very large incomes. However, we must be

guided by average experience in developing a general policy for the exploitation of patents.

The experience of our own company, Arthur D. Little, Inc., which is engaged in research and development for clients and on its own behalf is revealing. This indicates that, over a 14 year period, of inventions conceived and reduced to "an invention record" only approximately 30% will become the subject of patent applications. Of the patent applications approximately 70% will issue as patents. This means that from each 100 inventions only 21 patents will result. What now is the experience of these patents in producing income?

A careful examination indicates that the vast majority of patents will not be used in any significant way. A certain number will be employed as a basis for cross-licensing or other negotiations. Only between 2 and 8 per cent, depending upon what the patents are included in the count, will acutally produce substantial income. The lower figure of 2 per cent is obtained if the count is restricted to those patents which are truly the basis of the income. If improvement and fringe patents relating to these basic developments are included, the number rises to 8 per cent. In candor, it is recognized that licenses would not be taken or royalties paid if only the fringe inventions were in existence. Accordingly, inclusion of fringe patents results in a generous estimate of the number of patents yielding substantial income.

Rather similar data is available from a second source. There has been published by the Research Corporation of New York City, an organization which promotes inventions growing out of the R & D of various universities, data which is roughly comparable. Here again is to be noted the fact that of the 600 inventions offered to them during the period of study only 10% were accepted for exploitation. In turn, according to their published data, of the "cases" taken for exploitation, only 25% yield income in excess of $10,000 per year. Here again then is evidence that only a very small percentage of inventions or patents can be expected to yield significant positive income.

Data from a third source is not entirely comparable but is nevertheless revealing. The American Research and Development Corporation of Boston, Massachusetts is an organization which endeavors to locate and exploit new developments. In the course of several years of operation, they have examined and considered for exploitation approximately 3500 developments but of these have selected only 25 for promotion. Even assuming that all those selected will ultimately yield positive income, it will be noted that on the basis of this text, only 0.7% of developments, whether patented or not, would be actually productive.

Public Agency Not Suited to Patent Exploitation

In the light of the foregoing statistics, it is difficult to see how a public agency could successfully perform the requirements of patent exploitation. Is it conceivable that an agency supported by the public, and dependent upon public good will, could eliminate 90 or more percent of the inventions given to it for exploitation? Imagine the public reaction. How long would such an agency survive? And yet if it did not restrict its effort to exploiting the very small percentage of inventions which can be expected to yield sufficient income to be self-supporting, would not such an agency merely constitute an economic waste supported by subsidy at the expense of the remainder of our system? And how could any agency have the knowledge to evaluate the very wide range of markets and the requirements of cost and production needed to handle such a diversity of concepts.

The unpopular truth of the matter is that not all inventions and patents cover developments of real merit and usefulness. There is no certain way of determining which of the large number of patents issued will in fact make a beneficial contribution to its owner or the public. This uncertainty can be resolved only as the result of strenuous and often painful efforts on the part of the inventor and promoter and by ruthless and sometimes misguided rejection of the development by the many interests and forces which comprise the public market place. The type of promotional effort required to launch a new development is seldom found outside the heart and mind of the inventor and of sponsors who seek personal rewards from successful exploitation.

Having observed the launching of new products and processes at first hand, I would say that it requires the full time, day-and-night, efforts of the inventors and promotors motivated by self interest and the stimulus of personal rewards to overcome the many difficulties which lie in the way of those who advocate change, and novelty, and risk as against continuing to do things in the established manner. It is very doubtful that this kind of devotion and motivation could be found in personnel of a public agency who can gain little from success

while they stand to suffer criticism at almost every turn, and certainly where inventions fail. And should an agency act like owners or beneficiaries how could it then still perform the function of screening and elimination in the majority of instances?

The Policies Required for Promotion Difficult for Government Agency

In addition to the difficulties of screening and elimination, as well as the rigors of promotion, there are other reasons why a government agency would find it difficult to take the necessary actions required for successful exploitation of patents. It has been noted that to launch new inventions requires time and costs for study, development, production and distribution. Can a government agency of any reasonable size and budget be provided with personnel and funds to undertake the evaluations, developments, and promotions necessary to test all the new developments? If not, which of the developments will be selected for exploitation and which for rejection?

But there is also the matter of risk. Can a government agency wisely undertake the risks of not merely selection, but also promoting new items for which there is no demonstrable demand? A large proportion of new products fail each year. Can the personnel of public agencies risk association with the inevitable failures? To compensate for the failures the return from successful exploitations must be high. Can a public agency operating in what is presumed to be the public interest demand the high rates required? This would be "government in business" with a vengeance and in competition with private tax paying business as well! Can it allow others to demand such high rate?

In the light of the risks, the costs, and the need for high rate of return, in practice it has proved essential to the launching of new products that the exploiter enjoy the exclusive opportunity to do so. Can a public agency operated with public funds accept and promote the policy of exclusive licensing? Will not the cries against utilizing public property for private gain prove insuperable and prevent a policy of exclusive licensing.

A further difficulty will concern the type of licensee. At the outset, it was indicated that the objective of exploitation was volume production and distribution as a means to widespread use. This may well be best and most quickly achieved through exploitation by a large organization. In this day where small business is the favorite recipient of political care, is it conceivable that a public agency can safely grant exclusive licenses to large organizations? But if they do not, and seek only to favor small business, will this in fact achieve rapid and successful exploitation in the public interest?

For the various reasons suggested, it is believed that the policies needed for successful exploitation of inventions would not be feasible for practice by a public agency and hence that a public agency could not successfully undertake exploitation.

Exploitation Best Promoted and Achieved by Private Enterprise

It has been indicated above how costly, risky, and demanding of effort are the requirements for successful exploitation. It has been suggested that a public agency would find difficult the practical application of the required policies needed to achieve successful exploitation of Government-owned patents. Clearly, the required diversity of actions, motivations, policies, losses and decision to proceed or to abandon are best made by private individuals or organizations. It would seem that in this instance, our American free enterprise system can be enlisted and can be trusted. If an entrepreneur can be found to undertake the exploitation of the new development, and can be given the conditions necessary for successful exploitation, the greatest hope that patents growing from Government-sponsored research can be successfully exploited will lie in entrusting them to private development. The required conditions must, however, include the opportunity for exclusive licenses and the right to collect a yield from successful exploitation as high as the common market place will pay. Only by such means can the entrepreneur be enlisted in the first instance, and can be compensated for the enumerable failures which are bound to occur in connection with the launching of new developments. In this country we profess to believe in the free enterprise system and the soundness of the decisions of the market place. If we accept this philosophy, then the free enterprise system can be entrusted with the decision of which new inventions should be promoted and which will be accepted. The system has certainly shown that it can be productive. Inventors and promoters working in cooperation make the necessary decisions, provide the necessary means, and obtain their rewards. But it must never be overlooked that the

rewards of the inventors and promoters will not be secured without corresponding public benefit because return is only obtained when widespread use and its benefits have been achieved. This kind of private selection and exploitation can be as extensive and varied as the requirements of each invention. Each inventor and promotor will make his own analysis of the market, will devote to the exploitation his own effort and fortune, and none of this effort and cost will therefore result in costs to the public.

Public Exploiting Agency Not Needed

In conclusion we may summarize as follows: If the Government is to own patents but these patents are to be devoted to the public welfare, this welfare will best be achieved by entrusting the patents, as soon as possible, to the usual private means for the promotion of new products and services. These usual channels must be accorded the usual opportunities for personal reward. To curtail this is to curtail the effective operation of the private enterprise system.

In keeping with the experience of our system, the private benefits to the inventors and entrepreneurs will be coupled with widespread public benefit. Such public benefit can be achieved without the creation of a special Federal patent exploiting agency. It is extremely doubtful that a public agency could operate with equivalent success and without undue cost. In a time when Government expenditures are already high, and there is need to concentrate Government budgets on what is strictly essential, there is no demonstrated necessity for creating a patent exploiting agency to do a job which can be performed by existing private means.

Mr. Jackson: Our next speaker is the author of a leading text book on this particular subject entitled "Patents—Their Ownership and Administration by the United States Government." He is also the editor of the text which appeared last week entitled "Patents, Research and Management". He was formerly a Patent Attorney for the Army Ordnance Corps at Frankford Arsenal, and is now a Patent Attorney with the Rohm and Haas Company. His subject is "Getting the Most out of Government-Owned Inventions". Dr. Howard I. Forman.

Dr. Forman: Mr. Chairman, Dr. Bush, fellow panelists, distinguished visitors and guests, I had prepared to preface my remarks today with an explanation, but my colleague, Mr. Holst, has already taken care of that. Let me very briefly point out that although I speak for a certain point that has been assigned to me, I am not in sympathy with any policy that makes consideration of that point necessary; namely, I do not personally believe that it is necessary for the Government to take title and believe that there is a better policy pursuant to which there would not be this problem. I will mention briefly what the preferred solution should be at the terminal point of my talk. However, since I am charged with the responsibility of explaining what has been proposed in the way of solutions to the problem, namely, what shall the Government do with the rights to patents if it is going to acquire title to them, let me proceed along that line.

I would like to call your attention to a thought that I do not think any of our speakers has suggested, and yet I think it is all important. To begin with, let us not overlook some fundamentals. What are patents? What are the inventions to which they pertain? All of you in the audience have some idea but sometimes you forget this one point about them: every invention which is submitted for patent consideration represents a national asset. It has a potential value which may be very high, or not, as the case may be, but the fact remains that each invention may some day be the source of new developments that are essential to our national defense, it may be the answer to a better way of living, it may be many things to many of us, but in every case it is an asset that must be conserved.

We have heard many suggestions as to what shall be done with these inventions that are made by either Government employees or contractors, in any event, inventions which are at least in part subsidized by Government funds. People talk in terms of what is "right", and they speak in terms of the public's share in the investment by the Government. They give very interesting definitions of the term "public interest." But rarely do they ever think in terms of what should be the overriding consideration—that if these inventions are important potential national assets they must be conserved so that they give the maximum utility and benefit to the advancement of our public welfare.

I am charged with discussing the following topic: assuming the Government is going to take title, whether it is good or bad to do so, what are they going to do with the patented inventions which they own? First of all, let's consider the magnitude of the problem. It is estimated that the Government owns between 12,000–14,000 patents, and in another ten years the figure will probably go up to

15,000–20,000. That is the largest docket or portfolio of inventions of any single organization in this country.

What are some of the possible alternative things the Government can do with all these patents? In a recent report which Dr. Archie M. Palmer, first Chairman of the now defunct Government Patents Board, prepared on behalf of the National Aeronautics and Space Administration, he pointed out that there were four possibilities:

1. We can maintain the status quo, which is the current procedure whereby Government agencies will in every instance offer a royalty-free license to anyone who applied for it.
2. Another possibility is to do what has been suggested here today by one of the other panelists, namely, after the patent applications have been filed or without even going through that procedure, the invention can be described in a printed publication and thereby placed in the public domain.
3. A third possibility is to engage in an active and and aggressive patent licensing program. This is a program of the type carried on by some of the foreign countries but never yet tried in this country.
4. Create a special agency, or a Government corporation, something of the type we understand has been in operation in Great Britain or Canada for many years where the agencies carry forward the licensing program and the Government gets a financial return from it.

Another possibility, not suggested by Dr. Palmer but which must be considered to complete the picture, is that the Government shall do its own exploiting. This means that it would build plants, market products, enforce patents against infringers, etc.

If these are the possibilities, I say the most important consideration is: which one will best conserve our national assets? Let me remind you that when inventions are patented, they take on a most unique character. They may have the ability to induce people to invest time and money in developing them to commercial usefulness. They may also induce people to try to invent around them, as we say in the patent field, to try to avoid the issued patent. This often leads to the development of one or more other inventions. When people do any of these things, patents are functioning as the people who wrote the basis of all our patent laws into the Constitution intended that the patent system would do, namely to promote the progress of the arts and sciences.

What happens if we do not patent inventions? Well, inventions may lie dormant. Why? Because of the great risks involved and I think that you have already heard from Mr. Holst a moment ago just what this entails so I need not go into it except to point out that the same applied if you patent and then open up your patent to any one by granting free licenses to all applicants. Therefore, it is my position that inventions should be patented, first of all and they should be exploited.

You have to consider, then, the next question: "Who should do the exploiting?" I am not in favor of the Government doing it. This would place Government in direct competition with private industry. I think this would be a sad mistake and certainly contra to the system we believe in—private enterprise—in this country. Should it be left to industry? There have been a great number of evils that have been painted by people who think that this would be a mistake. I do not agree with them. I think there are ways in which these inventions can be put into the hands of industry and, with certain protective devices, assurances can be had that would eliminate most of the dreaded evils. These ways are encompassed in a plan I have advanced as an alternative to the various other proposals which have been made for dealing with the entire Government patent ownership and administration problem.

Before going into an explanation of that plan, I would like to call attention to the fact that the basis for the suggestion which I am advocating actually originated in 1945 when the National Patent Planning Commission made this statement in its recommendations: "The main objective should be to assure that the invention is brought into commercial channels at the earliest possible moment". Just a few months ago the Honorable Robert Watson, until very recently the United States Commissioner of Patents, writing in the Federal Bar Journal, said just about the same thing, and he asked, "Isn't it worth a try?" We in this country do not know if it would work but why don't we give it a try. Everything else has been suggested. Some things have been tried. It is about time we gave this one a chance.

In conclusion, I said I had an alternative plan: I call attention to the fact that this plan has been formulated into two bills which were introduced into our Congress on April 20, 1961, by Congress-

man William Green and Congressman Herman Toll of Pennsylvania. For those of you who may be interested, the bills are H. R. 6532 and H. R. 6548. In a word, what those bills would do is this: with regard to the inventions made by Government contractors title would vest in the contractors at the outset with a condition attached—that within a prescribed period of time, as for example five years after a patent issues, the contractor must prove to the satisfaction of the appropriate single Government agency, probably the Patent Office, that it has worked the patent. This is *compulsory working* which is well known in foreign countries but never tried here. This at least will give the invention a chance to get into public use. This is the important consideration. The fact that there may be derivative benefits that some private people may get, I believe, is merely coincidental and not the major consideration. The fact that government contractors may get an added advantage over others should be a secondary consideration to the question of what is best for out national interest. Putting as many of the inventive products of our Nation's brain power to work should be our foremost concern. Thank you very much.

Mr. Jackson: We will now proceed to answering questions. This question is a thesis subject which Dr. Bush will discuss for about a minute.

Dr. Bush: I have been asked whether a Government employee under a Government-owned patent should obtain rights for licensing to private industry. In answering any such question, one has to balance potential benefits against potential injuries. The benefits are easy enough to see. The issuance of a patent is primarily for the purpose of allowing capital to be used for the development of an invention. Every time we destroy a patent, we answer presumably to a public interest.

The potential damage in this case is this: If you have a laboratory in which a large and energetic group is working together for a common end and you have among those, individuals who are roughly working for private ends, you will destroy the morale of that laboratory.

On balance, my opinion is NO.

Question: Can you give an estimate as to what percentage of the total United States research dollar comes from the Federal Government?

Mr. Anderson: According to statistics put out by the National Science Foundation, fifty-nine to sixty-two percent of each dollar spent on research and development in the United States comes from the Federal Government.

Mr. Biebel: I think eight billion comes from the Government and about six and a fraction billion comes from industry.

Question: What happens to a Government employee who has rights to his invention?

Mr. Biebel: My thought is not that this publication patent would be mandatory on the Government; it would be optional. In cases where an employee has commercial rights, he would have the opportunity to have a regular application filed.

Question: Should the Government have title and is that likely to result in the best utilization of the inventions?

Mr. Holst: We were not supposed to discuss this question but I think I might dispose of a whole group of questions by saying that it has always seemed to me that what the Government is seeking when it now gets patents is protection in some way or other but actually the primary objective of Government research is not patents but is the solution of some difficult problem, a more rapid firing gun, a better space vehicle. Patents are quite secondary and the Government can protect itself in other ways. The secondary objective of Government research again should not be patents but the widest possible benefit. It is because I believe that the widest possible benefit comes about through wholesale use available to the public, not a nice file of patents in a cabinet but actual use, that I strongly advocate private ownership of patents and private commercialization and no Government agency, in fact not Government ownership of patents except under extreme conditions. That is a short treatment of a general set of questions.

Question: What about constitutionality of Government licensing of its patents?

Dr. Forman: The word "licensing" should be noted. There are actually two related questions that are frequently asked: one is concerned with the constitutionality of Government-owned patents, and the other is concerned with the licensing of those patents.

I believe that it is constitutional for the Government to take title to patents and it is constitutional for the Government to license those patents. Without going into details, if any one wants to look them up, I discuss this at length on pages 36–40 of my book "Patents—Their Ownership and Administration by the United States Government". There are

several statutes and there is a reference to the Constitution, Article 4, Section 3, Clause 2, which are cited as authority. The Department of Justice, in its 1945 Report, concluded as did Attorney General Stone, later Justice Stone, that the Government does have the authority under the Constitution to license patents.

Question: If the Government were to take title, so-called, while it could and then license any interested party for a reasonable royalty, would Mr. Anderson and Mr. Biebel's suggestions on publication amount to the same thing or would there be a difference in their views?

Mr. Anderson: It might not be the same. If the Government in my opinion were to enforce its patents by licensing for royalties, you would not get the same results as you would by virtue of this type of action. If before this kind of statute were passed, the Government had embarked on a program of licensing, I think probably you would find that if the invention was deemed to be able to be publicly promoted, by virtue of a licensing arrangement, exclusive or nonexclusive, that you would not get the benefits of Mr. Biebel's system as forcibly as you would at the present time where the Government generally licenses free.

Mr. Biebel: My comment is that unless the Government is ready, willing, and able to go into the business of bringing infringement litigation as a long term proposition, I don't believe this licensing program means anything. I don't believe it should do that, and therefore I favor the emasculating of the offensive character of these Government patents. I want to keep everything that they have defensively, and but to minimize them as offensive weapons except in the one instance of being able to prove prior inventorship which, in the last analysis, is defensive.

Question: If the Government pays for the research which leads to the patent, should it not in fairness be the policy of the Government to have the patent dedicated to the public?

Mr. Holst: The point I have been trying to make is: If what the Government wants is the successful solution to a difficult problem, that is the primary objective. If the secondary objective, which I take it is not seriously questioned, is how do you get maximum public good, then it seems to me that you have to play the game in such a way that the invention will actually stand a maximum chance of coming into widespread use. Public dedication has not been effective along that line. Instead private exploitation is actually the way by which we have our refrigerators, our automobiles, our many things which make the present standard of living. It may sound old fashioned and even corny but it is private enterprise which has given us what we've got. It is not public ownership and it is not public dedication and there is not a contradiction between private ownership and public benefit because there are not benefits from private ownership of patents unless they are put to widespread public use and if there is such use, there is public benefit. The question is: What is the most effective motive force? Is it Government ownership and public dedication or private ownership and private exploitation? That is the real question. What do you think is the answer?

Question: What about the idea of the Government selling exclusive licenses to private industry on a competitive bid basis? How about including some sort of limitation on the amount of such revenue, and tying in with the cost of research?

Dr. Forman: I do not think the Government should primarily or even secondarily go in the business of licensing just to make money. As a matter of fact, if you take a lesson from private industry, very few organizations do expensive research and development primarily to get patents from which to make income. Usually the quest for income from their patents is a secondary purpose. Certainly in Government this should never be the primary purpose. The Government is to serve the public. It should get its funds from other sources. Again, I must point out that, as I made my primary point in my talk, the main object of the entire patent activity of the Government is not a fiscal supporting device but to do whatever is best to get inventions into public use. Certainly, this business of licensing by the Government would be subject to tremendous abuses. For example, I can see immediately people complaining that companies with tremendous financial resources would be the ones that would get the patent rights and this would make them larger and larger and shut out small business. In every aspect I think it would be a poor policy. Yet I must say that if this were the only way in which it would be possible to get the inventions into public use, I would favor it. But I don't think that is the answer.

Question: Is the Government prepared to prosecute infringers, and has the Government enforced any of its patents?

Mr. Anderson: I don't know the answer to this. However in discussions with the Department of Justice representatives, I am advised that they have used U.S. owned patents defensively in suits in the Court of Claims and elsewhere. So that they have, to the extent that they have used them in a defensive capacity in suits, enforced them. As to whether they would sue infringers, I am advised that they found nothing basically in the law to prohibit the Government from suing infringers. We know that the Government also has used its patents in a type of enforcement—in connection with interference practice if you say that settlement by exchange of rights in an interference is an enforcement of a right in an invention—to that extent they have been used and enforced. As to actual suits, I know of none. I do know of two instances where the Government did defensively use patents to defeat potential claims that were brought but never got to litigation because United States patents of the Government were cited and the claimant backed off and so far as I know never instituted any action.

Question: Aren't you overlooking the fact that the Government is tending towards eventual exploitation of its patents by selective licensing and therefore a publication type of patent would be useless? This licensing may be for revenue, royalties and/or incentives for industry to further develop that particular field. Somewhat similar questions are, if no one will now use a Government patent unless there was an exclusive license, do you expect any one to use Government inventions, non-military, to set up an industry based upon unprotected Government inventions? And again, if no property interest is created by the publication patent, will there be any incentive to exploit the invention in the public interest?

Mr. Biebel: I think the answer to that is that there will be no more and no less than there is now, where the Government has title and does nothing about it. I don't believe that the records have shown any great willingness on the part of industry to spend substantial amounts of money to develop a product for the market place when they have what amounts to a free license from the Government with the knowledge that any one else can come in after they have done their research and promotion and take advantage of it and get the same free license. I do not favor it. As you remember, I am still a "con" man. I don't believe that we should have this Government ownership but if we are going to have it, and we certainly do have it to some extent now, then I believe the publication idea is a great relief in certain areas.

Question: Since ninety or so per cent of inventions are not going to be successful anyway, would it not be useful to have a Government agency to weed them out?

Mr. Holst: As an industrialist I might say *yes,* but as a practical man I say what agency or what industry can have the wisdom to do this well?

Question: This question challenges the figures used when Mr. Holst said that between 2–8 per cent of patents actually are productive. How do these figures check with much higher percentages of utilization as given, for example, in the Journal of the Patent, Trademark and Copyright Foundation of The George Washington University? Has credit been given for use to patents which are used in mutual exchanges?

Mr. Holst: You have to look at the figures with some care to see what it is that is being cited. If you say used by being referred to in a publication as we own such list a long list of patents, maybe you could expand my percentage of figures. The figures I have been using come to me from various sources—some of them first-hand in our own company, others from other companies with which I am first-hand acquainted, the others from other organizations. I do not change my opinion that so far as I know the number of truly productive, money making, actually utilized patents, not ideas, but patents, is quite small and it makes no difference whether you say eight or twice eight, it is still quite small. Can you conceive of a public agency which will have the ruthlessness to weed out some eighty or ninety or ninety-five per cent of the suggestions brought to it by its clients, namely, the public, on which it depends? Isn't it better to leave an unpleasant and difficult assignment like that to the public generally and to the public market place, leaving the inventor and his sponsors as the promoters and we the consumers as the answers?

Question: If Government-owned patents are to be enforced against infringers, would there be a single enforcing agency and uniform policy?

Dr. Forman: There is a presumption here that Government-owned patents are to be enforced. This has yet to be decided. However if we are going to have the Government taking title, and if we are going to have the Government trying to exploit the patents it owns, then the presumption must be, I would agree, that they should be enforced. I

do not think by any means that it would be desirable for the Government to do the enforcing, as by suing for infringement. This has been a suggested obstacle by many people to this whole program of the Government taking title. I disagree. I think and have recommended, and the legislation I advocate, incidentally provides indirectly that the infringement suit would be carried on by the people to whom the patents are licensed or assigned. If the contractor takes title, for example, conditionally or totally, he would have the obligation to sue. I think that legally we can pass on that authority to the contractor or assignee of the Government patent.

Now, with respect to whether there should be a single enforcing agency or uniform policy, I can state that I am definitely in favor of a uniform policy in this entire field. I know I am a sort of a lone wolf here being in disagreement with many people in and out of Government regarding the idea of a uniform policy. It cheers me up to see that former Commissioner Watson, in his Federal Bar Journal article, agrees with the same idea of a uniform policy and favors a single agency as do I. There are many abuses in my opinion that have been going on for years because everyone who wants a Government license, even a royalty free non-exclusive license, has to find out what the rules of the game are in each particular agency. It's amazing how you get different results when you have to go to ten or twelve or fifteen different agencies to find out how to get a license from the Government, even one that doesn't mean anything, because it's royalty free. It could be disregarded, as nobody would bother you to begin with.

Question: Is legislation or a Congressional declaration of intent or policy needed before enforcing Government-owned patents?

Dr. Forman: When I answered my other question with reference to the Constitution, the Department of Justice Report, Attorney General Stone and certain Statutes, I think I saw specific authority for this. But even if there were no such authority in the statutes, I believe, along with the Justice Department opinion, that together with the right inherent in the Government's taking of any form of property, and I believe they have this right to take rights to patents, they have the right to use it; this would mean enforcement. But if there is any doubt about it, since our Congress is at this time vitally interested in this entire question, there should be no problem. When they come up with the solution, they could put in an express proviso that the Government could do this.

Question: If private industry insists on the industry owning the invention made by its employee, how can that same industry object to the Government owning the inventions made at Government expense?

Mr. Holst: A very interesting question but not one that to me is insoluble. What are we seeking? If we are seeking the best solution to Government's problem as primary objective and secondarily, if we are seeking the widest benefit, then the question is: How do you get the best answer to the Government's difficult problem in the first place? I think the answer is you get the best possible people with the most pertinent background to work for you. Second, how do you get the widest possible benefit from new inventions? By getting them most widely exploited, not necessarily by having a private citizen or an individual owner, but how do you get them most widely exploited? Those are the questions to which you can provide perfectly good answers. I have been taking the position that widespread exploitation will come from private ownership, not from Government ownership and not by dedication to the public. It seems to me this is what experience has shown, both negatively and positively.

Mr. Anderson: I wonder if I might interject a question. I wonder if Mr. Holst's views would be the same where you have a captive contractor operating a Government owned facility or a Government owned and operated laboratory where there is no company activity brought to the facility?

Mr. Holst: I would give the same answer. The question is not really, does the contractor have any right to own but rather how can you get the maximum good? I still say again by enlisting the best possible contractor, captive or not, and secondarily, by giving him all the incentive you possibly can to publicize and commercialize and make widely available what he gets, and that second requirement as I said before, is not the kind of requirement the Government really likes to deal with, but I think it is real.

Moderator: May I interrupt? There are two men responsible for organizing this program. One is Bill Schuyler who is away trying a case today. The other is Terry Rice. Would you stand? (Applause.)

It would take till about 3 A.M. tomorrow to answer all the questions so I am going to ask, rather

ruthlessly, the panelists to extend their remarks for the benefit of the record.

Let's give the panel by way of appreciation a rising vote of thanks as we adjourn. (Applause.)

Answers to Questions Submitted to Lawrence B. Biebel on "Publication Patent" Proposal

Question: There are several questions dealing with whether a publication patent would be a proper basis for establishing a Convention date in filing a corresponding application in foreign countries.

Answer: The intention definitely is that for all purposes, under our law, the publication patent would be filed in the same manner as any other, except for the formality of claims which could be replaced by an informal résumé, and hence should be entitled to all the rights under the International Convention as with any other application. It should therefore have the same value in negotiations and patent exchanges between governments.

Question: There is another group of questions dealing with rights to inventions made by government employees who are entitled to commercial rights under Executive Order 10096 and the question deals with their position if a publication patent were taken out on their inventions.

Answer: In my opinion Executive Order 10096, was and is unfair to the government employee-inventor, an able but somewhat inarticulate group which certainly should not be further deprived of the rights that remain to them. I would retain the right in all cases for applications to be filed by government inventors in the same manner as they are today, i.e., as normal applications, not applications for publication patents.

Question: Is it included in your proposal that other applicants than the government would have the option of filing for a publication patent?

Answer: This is a logical extension of the plan but for practical reasons it seems expedient to develop the acceptance of the plan as initially limited to government inventions where the situation is probably more acute.

Question: Why limit the number of species in a publication patent if there are no claims? A normal *disclosure* is not so limited in general.

Answer: Concern has been expressed in some fields, particularly the pharmaceutical field, that if there were no control over the extent of the disclosure it could be packed with all manner of prophetic suggestions without any semblance of a real invention having been made, and thus preclude protection on the actual invention when made at a later date. It seems also that the Patent Office should retain enough control to avoid jumbo disclosures which would contain unrelated subject matter, or which would not represent any advance in the art. A similar function is performed regularly by editors of technical publications.

Question: As no one will now use a U.S. Government patent unless there is an exclusive license, do you expect anyone to use Government inventions, e.g., non-military, and set up an industry based upon unprotected Government inventions?

Answer: No, no more than they would at present where the Government holds patents on a particular item. Patents are not self-enforcing, and have real value only when they are administered and enforced. I do not advocate having the Government commit itself to suing its citizens for patent infringement. The publication patent is an honest recognition and acceptance of the present de facto situation.

Question: If you give to the Government the right to defeat the claims of a pending application on the basis of a quasi-interference contest, should not a similar right to contest priority be given to private applications which describe but do not claim the subject matter, e.g., should not patentees sworn back of under Rule 131 be heard from on date of invention?

Answer: Yes. Careful analysis of the different potential situations where an interference could arise seems to show that the preferred practice would be to allow a normal applicant to swear back of the filing date of a publication patent without reference to whether it is "claiming the same invention" and irrespective of when it is cited, i.e., possibly more than a year after its own publication date. It would be a statutory bar only as to other applications filed more than a year after its publication date.

The Examiner on his own motion could in such cases call on the publication patentee for invention dates of the claims pending before him in the normal application and set up an interference of his own motion. If he did not do this and the normal application later issued, the publication patentee could at that time copy the claim and the interference be proceeded with in the normal manner. In this way it is thought that the rights of all parties are most adequately protected and with the minimum procedure and restrictions being involved.

In all cases of interference involving a publication application or patent, the function of the law examiner would be suitably expanded to include additional correspondence with the applicant as to whether he could or should make a claim drawn in specific language, and a more comprehensive examination of his invention dates to be satisfied that an interference in fact does exist.

Answers to Questions Submitted to Howard I. Forman

Question: If we can no longer depend on private enterprise to do all the research and development needed in this country, how can we depend on private enterprise to take on the development of inventions paid for with government funds? That is, if industry shows no interest in a government-owned invention shouldn't we try to add incentives such as exclusive licensing, or if this fails, direct involvement of government in development and distribution?

Answer: I agree with your general point that the principal objective should be the development of each such invention into a useful end product. It may very well be that private industry will not want to take on the development of inventions arising out of government contracts. If this is the case, then the government should get involved in whichever way is best suited to accomplish such development. This may require giving incentives as exclusive licensing (which I favor as the initial approach), or if this fails and it appears that an important invention may be relegated to the discards perhaps the government should invest in the plant, etc., needed to mature the invention into a useful end product.

Question: If government-owned patents are to be enforced against infringers, would there be a *single* enforcing agency and a uniform policy? Is legislation or a congressional declaration of interest or policy needed before enforcing government-owned patents?

Answer: Any matter of enforcing government laws normally is a responsibility of the Department of Justice. I would expect that agency to be charged with the enforcement of the Government's patent rights if it becomes the policy of the Government to sue infringers. I would certainly expect that a uniform policy would have to be established or else there would be considerable confusion among the various agencies and the public as to which patents would be enforced, what would be the criteria for enforcement, and how such enforcement would be administered. As for needing new legislation, I doubt it. The people in the Department of Justice patent department are confident that they would not need new legislation to sue infringers of Government-owned patents, even though they have never yet attempted to do so. (See page 39 of my book identified in the answer to the first question above.)

Question: 1. To what extent have licenses been requested under Government patents listed as available for free licenses? 2. Do you know of any foreign government that has demonstrated that a profit was obtained from its licensing for royalties, of government patents?

Answer: 1. The following information is taken from Dr. Archie M. Palmer's report under NASA Contract NASA–177, "Administration and Utilization of Government-Owned Property (1960)" at page 24. From 1935 to 1952 the Government owned over 4,000 unexpired patents, and had granted 968 licenses under them, 803 in the last nine years of the period. 2. According to Dr. Palmer's report (page 60), the British spent 2,559,000 pounds in a ten year period (of which 1,991,000 pounds was on development projects), and received 1,045,000 pounds in revenue. Of course, the intangible value of the developed projects must be considered but are difficult to evaluate in terms of money. Canada (Palmer report p. 70) appears to have made a small profit in 1959 and 1960.

Question: What do you think about selling exclusive licenses to private industry on a competitive bid basis?

Answer: This idea has in its favor one thing which I think is good, namely that it should tend to get segments of industry to work on the development of patented inventions. However, against the proposal is the likelihood that it will tend to give the larger corporations, which can afford to outbid small firms and individuals, the best possible chance to monopolize the patents in questions.

Question: What is wrong with the Government taking title and licensing for royalties with a limitation on the revenue to the cost of the research and after that dedication to the public?

Answer: My objection to this proposal is that fact that upon dedicating the patents to the public the chances are that there will be little or no attempts by anyone to develop the inventions to the point of commercial acceptance. Without the exclusive right under the patents there may be no willingness to invest in manufacturing a product

which may first need considerable development work, and run the risk of others entering into the field as competitors when the development work done by the first party is completed.

Question: By what right or authority can the government collect money (royalties) from the public when the government and the public are or should be one and the same?

Answer: By the same authority that permits the government to charge for leases to real property, the sale of lands, or any surplus property. There is considerable authority in favor of such a right. See pages 37–38 of my book referred to in answer to the first question above.

Answers to Questions Submitted to Helge Holst

Question: Since the public pays the expenses of Government research, is it not fair and equitable to have all Government Patents dedicated to the public?

Answer: While the simple answer to this question might seem to be yes, this answer would not, in all likelihood, produce the most desirable results. As stated in the formal presentation, what is sought when contractors work for the Government is, first of all, a successful outcome to the specific assignment for which the contract was made. The development, ownership and exploitation of patents is quite secondary. Nevertheless, this secondary feature is important because it is by this means that the general public will or will not benefit from the developments flowing out of the initial assignment. Experience has indicated that mere "dedication to the public" or general availability of Government Patents for use by everyone has not resulted in the commercialization and widespread availability of developments. It appears to be only when a private interest is willing to take the risks and perform the extra activities required to find financing and production that new items are actually launched and produced in quantity and therefore benefit the public.

Question: Since the Government pays the cost of the research which gives rise to the inventions, should private entrepreneurs be permitted to obtain exclusive profits, or should they pay a percentage of the profits to the Government?

Answer: This is a reasonable suggestion. If the conclusion expressed in the formal presentation and in the answer to the previous question is accepted, i.e., that it is only by the efforts of an entrepreneur that the public will actually benefit, then clearly the entrepreneur has made a contribution to the public welfare for which he is entitled to benefit. It is difficult to measure the relative contributions of the Government and the entrepreneur. For example, if the original contractor did successfully solve the Government problem at a reasonable cost, it is possible to argue that the Government was entitled to no more than that solution, i.e., that the patents might well be a part of the consideration or price to be paid to the contractor. However, there is merit to this question and it is possible that the equities would be served in many instances by some type of royalty to the Government. This royalty, however, must recognize not merely the Government's original research costs, but the entrepreneur's further contributions of effort and financing required to launch the inventions.

Question: Why can't the Government sell surplus patents it owns in the same way that it sells other surplus property?

Answer: I see no reason why it should not be able to sell patents just as it can sell other property. However, the basic questions discussed in the formal presentation was whether the Government should own patents in the first instance or should be content with licenses to use the patents, with ownership and the right to exploit remaining in private hands in the belief that by this means new developments are most likely to be promoted in the public interest.

Reception and Luncheon

Thursday Afternoon, October 19, 1961

A Reception and Luncheon was held at the Washington Hotel at 12:30 P.M. under the auspices of the International Patent and Trademark Association and the Patent, Trademark and Copyright Section of the Bar Association of the District of Columbia, Mr. Merwin F. Ashley, presiding. Mr. Ashley introduced Honorable Guillaume M. Finniss, Director, Institut National de la Propriete Industrielle, Republic of France, and Honorable L. S. Davar, Patent Attorney, Calcutta, India.

Director Finniss: When I received from your Embassy in Paris your invitation to attend the celebration of the American Patent System and was asked to say a few words on this occasion, I was, of course, very proud of the honor extended to me. At the same time, I was at a loss because it is very difficult to talk in a language which you haven't completely mastered, especially when you are listened to by a gathering of specialists and of brilliant talkers at the same time. And what about the topic? If I choose one of those which are so boring that it would be necessary to use the method of those men who talk on television and use arguments to convince you to buy what you don't need, you would be inclined to fall asleep and to think that I am one of those men which the French call "epouvantable raseur". Then I decided to select a topic that sells itself, the common market. You know that when the "six governments", as they are now called, decided to sign the treaty known as the Treaty of Rome, they had in mind the formation of the six nations into one territory. Yet it could seem very strange that in the Treaty of Rome nothing is said about industrial property, in spite of the fact that industrial property could be from a certain point of view considered as a basis of territorial monopolies. I should say more. In the Treaty of Rome there is an Article 36 in which it is very clearly stipulated that the member countries have the right to maintain all their national laws of industrial property. In spite of this very peculiar situation, the six governments have decided to create a body to study what could be done in the field of industrial property, and I had the honor to be appointed Chairman of that body. We prepared a report 18 months ago, a report prepared with the cooperation of three subcommittees—one in charge of patents, one on trademarks (the Chairman of the Subcommittee on Trademarks is my friend, Mr. de Haan, whom you know), and another one on designs. And what did we say in the report? In the report, we said that it would be wise to prepare three conventions. Three conventions—one of them would be the patents convention. Let me talk now only about patents. Being understood that what would be created, that is to say, a European patent, would not mean at all during the certain period of time the cancellation and destruction of the national system. That is to say, in our reports we advised the government to envisage the possibility of creating a European patent coexisting with national patents. As a matter of fact, it was necessary that rules of substantive law should be written in the convention, rules concerning patentability, inventive step, nov-

elty. It was at the same time very clear in our minds, and we stated very clearly to the six governments, that these patents should at least be under the jurisdiction of an international court having the jurisdiction to decide if this international patent was valid or not, leaving to national courts the duty of deciding when there was or when there wasn't an infringement. I know that, from your point of view, it may seem strange that we should divide the work between a national court and a supreme international court, but it is too long to explain practically that such a system could work very well owing to the judicial system we have on the Continent.

Gentlemen, it has been said in the reports that the convention we are preparing meant, of course, the creation of an international patent office, this international patent office being an independent body and the novelty search being in trusted to the International Institute of the Hague, because the six countries are not ready to destroy what four of them have created a couple of years ago. What is extremely important, from your point of view, is that this convention as we reported should not be considered as a convention inside the Common Market Treaty. Why? For the first reason, I told you at the beginning that this convention does not derive from a clear stipulation of the treaty, and we thought at the time we prepared our report that the time would come when perhaps other countries would like to join the convention. If we created a system inside the Treaty of Rome and if we said this convention is open to the signature, for instance, of the United States, you couldn't join the convention because you would have, at the same time, to join the Common Market Treaty.

Well, up to now, you could think that we only made a report, that nothing else has happened. It would be completely wrong because this report has been turned into a protocol and this diplomatic protocol has been accepted by the six governments so that now it is no longer our report, it is the decision of the six governments to prepare, I say prepare, they have not decided to sign, they have decided to prepare a convention creating an international patent. Gentlemen, what will be the situation of other countries toward this patent? Of course, you imagine that the patent we are preparing is a patent subject to a search and it is a classical type of patent which you have in the United States or which they have in Germany. But the problem which followed was—would it be possible for a citizen of a country that has not joined the convention to file an application with the international patent office? On that very important question there are two theories. One, according to which nobody could find in such a convention the creation of a new substantive law, or more exactly, of a new law. Of course, the rules will be somewhat different from the national rules, but it is understood that it will be more difficult to have this international patent granted than to have the six national patents granted, in which case it would not be impossible according to this first theory to say that countries whose nationals, countries who didn't join, cannot ask for their nationals the permission to file an application to the European patent office. That is the first theory. The second theory is that it should be entirely and freely open. But up to now this question has not been settled and it leads me to explain exactly where we are now. Now we have received from the government the order to carry on, that is to say, to prepare the text for the diplomatic convention. But, such a problem as the one I was referring to is the problem on which we have the possibility as experts to give the governments all the elements upon which they could base their decision, and it is very clear that when the decision is taken it has to be one decision, it is not possible at this stage to keep the two theories. We have to choose one or the other. Gentlemen, I really think that our work should not be at all considered as a kind of academic exercise. It would be a very wrong idea of what is going on. I think that within two years, a convention, this diplomatic convention, will be signed. If it is not signed, that would mean that the six governments have decided to stop the growth of the Common Market, in which case, of course, the decision would not be an industrial property decision but a very general decision. If, on the contrary, you think that the Common Market is still alive and in good health, if you think that other countries, such as Great Britain, for instance, such as Switzerland, Denmark, and I think some other Scandinavian countries, contemplate joining the Common Market in some way or another, then it is very clear that this convention on patents will be signed by the governments. In that case, I am sure that a country like yours, a country in which international cooperation is an expression which you understand very well because you are very keen about international cooperation, will have to do in the field of industrial property what it has not done up to now. To speak frankly, you keep away from all those international agreements which are centered around the Geneva

Bureau, I mean in the field of copyrights, and in the field of industrial property you have kept away from the Arrangement of Madrid in Trademarks and from the other special arrangements. Gentlemen, I am sure that, if the Common Market grows, our convention being signed not by six countries, but perhaps by 12, by 30, we will have the pleasure of seeing our colleagues, our friends, travel not from Rome, not from Paris, but also from Washington to Brussels. You will have to join our committee and it will be for us a very great pleasure. Ten years ago, whenever there was an international meeting, it was very seldom that we met American representatives, but now, gradually, we have got in touch and we meet as often as possible with results that seem to be very good. My wish is that, gradually, this industrial property family will receive an acting member of great importance which we like very much—I mean the United States of America. Thank you.

Honorable L. S. Davar: I feel greatly honored to be given an opportunity to address an august gathering of such learned people who are present here today to celebrate the 125th Anniversary of the Patent Act of 1836 in the United States.

Your patent system, as the President of the United States has observed, contributed so greatly to the encouragement of inventive genius. Your nation is rightly proud of having conceived in the majority of over three million ideas for which patents have been granted in your country, and more and more inventions are flowing out of your research laboratories primarily for the good of mankind. Your policy of sharing the knowledge that you have obtained, and thus aiding other countries, and particularly my country, India, has prompted me to give you a short talk on the Indian Patent System which is fifty years old and has resulted in about 1/40th of the number patents issued in your country. I will also give you some idea of the third five-year plan which the Government is now implementing.

The Indian Patent System was set up in 1911 and is largely based on the British System. We have an examination and the staff of controller, deputy controller, assistant controller and examiners are all qualified people. In spite of the increasing number of applications, they are performing their duties in a very responsible manner. The citations generally which are given in the examinations consist of prior Indian patents.

The Indian Patent Office receives gazettes of the United States, Canadian and Australian Patent Offices and abridgement of U. K. patents, but the degree of anticipation by these publications is determined by what is published in these gazettes and abridgements. Publication outside India is not regarded as a publication in India. In India it is possible for an importer of an invention to claim to be the true and first inventor. A patent application must be accepted within a period of eighteen months but a maximum extension of three months only is permissable. After acceptance and within four months of the date of publication, it can be opposed.

We also have in the Indian Act, provision for compulsory licenses due to non-working for three years from the date of final grant, which is virtually five years from the date of application, but, as you all appreciate, the know-how is as significant as the patent, and therefore, very little advantage has been taken of this provision for the number of applications during the last twelve years has not been more than two, in a year. The same provisions apply to drugs and medicine, insecticides, and any other chemicals required in the production of food and medicine. According to our experience, it is not very beneficial to apply for a compulsory license.

A patent relating to atomic energy can also be filed but for the last few years, the applicant has been ordered to keep it secret. However, the controller is empowered to condone the delay in the prosecution of these applications.

India is not yet a member of the International Convention but has a bilateral arrangement with countries of the Commonwealth. I, however, personally feel that if the Government is convinced that it will be in its interest to join the Convention, it will not hesitate to do so, and I am looking forward to light in this respect from our learned friend, Dr. Ladas.

We have also in India a sound system for registration of trademarks and for protecting the rights of the proprietor. In some quarters, however, it is felt that our system of licensing the use of trademarks is unnecessarily cumbersome, but you will appreciate that the idea behind it is to prevent trafficking in trademarks. At any rate, it is not so monsterous as it appears, and in all genuine cases, there should be no difficulty in meeting the requirements, however awkward they may appear, on the first reading of the provisions of the Act.

I will now deal with the five-year plan about which I spoke earlier. India has already gone through two plans of industrial development of five years each and has sufficiently advanced and developed the basic industries in the country. The

third five-year is now being implemented. The industrial production in all commodities has gone up almost twice during the last ten years.

The present plan of five years will call for an expenditure of about $23,625 million. I have converted the rupees into dollars.

The main feature of the industrial program includes increased production of iron and steel, aluminum, copper, zinc, installation of foundries, manufacture of heavy machinery, electrical equipment, machine tools, electrical and diesel locomotives, motor cars and commercial vehicles and in the chemical field, fertilizers, sulfuric acid, caustic soda, soda ash, organic chemicals, dyestuffs, drugs and pharmaceuticals, plastics, manufacture of cotton textile, rayon, textile fiber, paper and newsprint, sugar, vegetable oils, building materials including cement, setting up of oil refineries, and exploration of oil and all industries complementary to aforesaid industries.

On the second of this month, our Finance Minister, Mr. Morarji Dasai, while opening a branch of India's investment center in New York, said that foreign investors would find in our policies distinct evidence of our interests. He further said that we have always permitted the foreign investors the right of repatriating capital, and remittance of profit in foreign exchange and we intend to continue this policy. He also said that the Government has guaranteed in agreement with the United States against exploration and ensuring convertibility. We believe he said that there is ample room for development of joint business venture in fields where capital and know-how are needed from abroad by Indian investors.

We foreigners know that you are a great nation—morally, intellectually, and industrially. Everything you possess is large. You have undertakings, the magnitude of which we cannot visualize. You have made wonderful inventions in practically all fields of science, medicine, and agriculture. In fact, everything in your country is basically big and large. But apart from these possessions, you possess something else of which you should be rightly proud of and that is that you possess big hearts, full of kindness, fraternity and help, and it is this which has appealed to us Indians the most.

Our leader of recent times of whom you have heard, namely, Mahatma Ghandi, once said "Some men loom large by lifting up others, and others loom large by kicking and humiliating others". This, he said, is the difference between the benefactor and the bully. You belong to the class of benefactors.

With these words, I take leave of you and thank you all and the sponsors of this organization for giving me an opportunity to talk to you. Thank you.

Dinner Meeting

Thursday Evening, October 19, 1961

The dinner meeting of the 125th Anniversary of the Patent Act of 1836 convened at eight o'clock p.m., in Sheraton Hall, Sheraton-Park Hotel, Washington, D.C., the Honorable David L. Ladd, Commissioner of Patents, Master of Ceremonies, presiding.

Commissioner Ladd: Ladies and gentlemen, will you please stand for our National Anthem. (Anthem; audience standing.)

Ladies and gentlemen, please remain standing. For the benefit of some of our foreign guests, we have a custom in this country of thanksgiving before a meal. We ask all of you to join for a few seconds in silence in a common hope for the welfare of all men everywhere and for the hope for peace for the world for all time. (Silent Thanksgiving.)

This is a truly wonderful birthday party. Without in any way detracting from the serious significance of the purpose for which we are gathered in this celebration of the 125th Anniversary of the Patent Act of 1836, the festive climate and atmosphere of this evening together is a very happy thing to share.

We owe a great deal to a great number of people, some of whom it is my pleasure to introduce to you tonight. Before I do, however, I am sure that I speak for all of you when I express to the United States Marine Band and to its leader, Captain Hartman, our sincere thanks. (Applause.)

We are privileged tonight to have with us many distinguished guests. It is my honor to introduce them to you and I wish to begin with those who are seated tonight at the head table, and I should like to ask our guests—as a matter of fact, some of them are not guests, but are quite active participants in preparing this entire celebration—to stand and to receive your applause for them jointly at the end of my introduction.

The Under Secretary and Mrs. Gudeman unfortunately are not able to be with us this evening but they asked me to express their regrets and their congratulations to the Patent System.

On my right—and I will ask each of you to stand please—is Dr. Vannevar Bush. (Applause.)

Dr. Bush appreciates this expression of your admiration but we have a long program and please hold your applause.

To his right, Dr. Alan T. Waterman. (Applause.)

May I also introduce to you, Mrs. Alan T. Waterman. (Applause.)

Mr. and Mrs. Roberts B. Larson. Mr. Larson is President of the American Patent Law Association and Chairman of the Policy Committee of the Celebration.

Mr. and Mrs. Charles F. Gareau. Mr. Gareau is President of the Patent Office Society and Chairman of the Working Committee for the 125th Anniversary Celebration and much of the success of this occasion is due to him.

Mr. and Mrs. Joseph Gray Jackson. Mr. Jackson is Chairman of the Section of Patent, Trademark and Copyright Law of the American Bar Association.

Mr. and Mrs. Boynton P. Livingston. Mr. Livington is Chairman of the Patent, Trademark and Copyright Section of the Bar Association for the District of Columbia.

Mr. and Mrs. Philip Talbott, representing the Chamber of Commerce of the United States.

Mr. Merwin F. Ashley, President of the International Patent and Trademark Association.

Mr. Harry Mayers of General Electric Company, representing the National Association of Manufacturers.

Mr. William H. Webb, Chairman of the National Council of Patent Law Associations.

And Mr. John Rex Allen, President-elect of the American Patent Law Association.

We are also privileged to have with us at this celebration many friends from abroad and we wish to thank them for their expression of friendship in their very presence, and for the other expressions of friendship which they have made through their attendance here and in particular, I make reference to generous remarks which were made this afternoon by Mr. Davar of India.

I should like now to introduce our friends from abroad. Let us follow the same procedure and please hold your applause until the end.

Mr. Cecil N. Jeffery, Supervising Examiner, Classification Division, Australia.

Mr. Friedrich Lang, Economic and Technical Counselor, Embassy of Austria.

Dr. Mario Valarde Dorado, Director, Patent Office, Bolivia.

Mr. Kreng Nill, First Secretary of the Embassy of Cambodia.

Mr. and Mrs. J. W. T. Michel, Commissioner of Patents, Patent and Copyright Office, Canada.

Mr. F. W. Simons, Assistant Commissioner of Patents, Patent and Copyright Office, Canada.

Mr. S. T. Shang, Director, The National Bureau of Standards, Republic of China.

Mr. Virgile Tevoedjre, Foreign Office Director of Cabinet, Dahomey.

Mr. L. F. W. Knight, Superintending Examiner, The Patent Office, United Kingdom.

Mr. Guillaume M. Finniss, Director, the Patent Office, France.

Mr. Andre Jean Francois Germa, Ministry of Defense, France.

Mr. Mehdi Naraghi, Director, Office of Companies, Registrations and the Industrial Property, Iran.

Dr. Hossein Bassir, Judge of the High Court, Iran.

Mr. Kazem Banan, Assistant to the Director General, General Registration Office, Iran.

Mr. Kotaro Otani, Chief Examiner, Patent Office, Japan.

Dr. C. J. deHaan, Director, Patent Office, The Netherlands.

Mr. A. J. Bulder, Vice Director, Patent Office, The Netherlands.

Mr. P. van Waasbergen, Vice Director, International Patents Institute, The Netherlands.

Dr. Julian Bendana, Commissioner of Patents, Nicaragua.

Mr. John Helgeland, Director, Patent Office, Norway.

Mr. K. Ueland, Patent Office, Norway.

Mr. Tiburcio S. Evalle, Director of Patents, Patent Office, Philippines.

Mr. Claës Uggla, Head of Law and International Affairs, Patent Office, Sweden.

Mr. Tore Oredsson, Bureau Director, Patent Office, Sweden.

(Standing ovation.)

I hope our friends from abroad feel and accept the warmth of the welcome expressed in that standing ovation.

I should like now to introduce another group of people representing the National Sponsoring Committee of this Celebration of our 125th Anniversary of the Patent Act of 1836. I shall ask you to follow the same procedure.

Mr. and Mrs. E. J. Brenner, representing the American Institute of Chemical Engineers.

Dr. and Mrs. Carlton C. Long, representing the American Institute of Mining, Metallurgical, and Petroleum Engineers.

Dr. Elmer Hutchisson, representing the American Institute of Physics.

Mr. and Mrs. Miles Clair, representing the American Society for Testing Materials.

Mr. and Mrs. Ernest H. Hanhart, representing the American Society of Mechanical Engineers.

Colonel and Mrs. Walker L. Cisler, representing the Society of American Military Engineers.

Judge Eugene Worley, Chief Judge, United States Court of Customs and Patent Appeals.

Mr. and Mrs. Conway P. Coe. Mr. Coe, of course, is a former Commissioner of Patents.

Colonel Lawrence C. Kingsland, former Commissioner of Patents.

Mr. and Mrs. Robert C. Watson. Mr. Watson is also a former Commissioner of Patents.

(Standing ovation.)

It is also my privilege to introduce the next speaker. I shall do him the compliment and you the favor of making the introduction short. The man whom I introduce is a distinguished American, educator, administrator, scientist, and business man.

He holds degrees from Tufts. He also holds honorary degrees from many universities, of which the only one I shall mention is Harvard. (Laughter.)

He has been a professor, the Vice-President, and Dean of Engineering at one of our greatest Ameri-

can institutions, The Massachusetts Institute of Technology. He has served as the President of the Carnegie Institution, Director of the Office of Scientific Research and Development, Chairman of the Joint Committee on New Weapons and Equipment of the Joint U.S. Chiefs of Staff.

He is a Director of American Telephone and Telegraph Company. He is an author and has received innumerable awards. He has crowned all of these achievements by serving as the Chairman of the National Sponsoring Committee for the Celebration of the 125th Anniversary of the Patent Act of 1836. (Applause.)

He can, I think, be characterized as an admiring critic of the United States Patent System. It does me great honor to introduce to you Dr. Vannevar Bush. (Standing ovation.)

Dr. Vannevar Bush: Commissioner Ladd, honored guests from overseas, ladies and gentlemen, I have one objection to that introduction. I earned that degree from Harvard University. (Laughter; applause.)

I am tempted to make you a long, elaborate and complex speech on the subject of the Patent Office and its importance in the Patent System as an important integral—the essential part—of our free enterprise system, but I will refrain. (Laughter.)

I will refrain for two reasons. In the first place, I think that message given here might have some resemblance to a Democratic political speech in the town of South Boston. (Laughter.)

There would be no converts. (Laughter.)

But I will refrain for another and a far more important reason, because I bring to you the testimony on this point of an individual whose word will be heard outside of these halls. I have a letter:

> "Dear Dr. Bush: I am pleased to send greetings to the delegates from home and abroad who are in Washington to celebrate the 125th Anniversary of the American Patent System.
>
> "It is significant that we commemorate a system so heavily woven into the fabric of America. But it is especially significant that this celebration brings together men of different interests, from different lands and different cultures, men who have come here not to frustrate progress, but to exchange scientific and technical information.
>
> "I hold high among the elements of peace the free exchange of information. I am pleased to note that this is the course you have outlined for this conference. The patent files of this and other nations are treasures of applied technological and scientific knowledge. The free exchange of this knowledge can serve the aims of peace and help encourage the development of newly emerging and backward nations.
>
> "In our system, the incentives offered by patent grants have given great stimulus to economic growth and prosperity. The technological advancements which have been fostered here have contributed to the well being of people everywhere.
>
> "Technological growth, guaranteed as it is in our Patent System, has thrust us into a position of world leadership. Continued technological growth shared with our fellow man will make ours an enlightened leadership, will strengthen the American Patent System, and promote world peace and prosperity."
>
> Signed: "John F. Kennedy, President of the United States."

(Applause.)

Commissioner Ladd: Thank you very much, Dr. Bush. Thank you, too, for all of your efforts in our behalf in this Celebration.

Perhaps the most outstanding distinction of our principal speaker this evening is that he had the good judgment to marry a most lovely and charming lady whose company I have had the pleasure of having at this dinner.

Dr. Waterman holds three degrees from Princeton. I searched earnestly through his honorary degrees and found none from Harvard. (Laughter.)

He has taught at the University of Cincinnati and at Yale. He has served as the Department Chief and Chief Scientist of the Office of Naval Research. He has been the Director of the National Science Foundation since 1951.

His contributions to the scientific community, to science and to the country have been acknowledged in many ways. He has served as a member of the Board of Directors, Center for Advanced Study in Behavioral Sciences; as a consultant to the President's Science Advisory Committee; and as a member of the National Aeronautics and Space Administration.

His talents and achievements, however, are not confined to the sciences. They extend indeed to the humanities, for he is, I am told, an accomplished bagpipe player. (Laughter.)

It is a high honor to introduce to you Dr. Alan T. Waterman. (Applause.)

Dr. Alan T. Waterman: Mr. Commissioner, Dr. Bush, distinguished guests, ladies and gentlemen, it is a privilege to be with you this evening on one of the several occasions that have been arranged in celebration of the 125th Anniversary of the Patent Act of 1836. Having only just observed the 10th Anniversary of the agency with which I am associated, I am awed by such venerability. I hope that when the National Science Foundation attains such ripe old age, the occasion will be marked by as distinguished a company as is gathered here tonight.

When I asked myself what point of view I, as a relative outsider, should present this evening, I reflected that probably there is greater knowledge of the patent system concentrated under this roof than has ever been assembled before in one place. There would be nothing I could add, therefore, to what you already know about this important aspect of our economic system. Furthermore, the National Science Foundation is primarily interested in basic research, which in its own domain, is antithetical to the purposes for which the patent system was established. It is the common belief of scientists generally that new knowledge and discoveries of the working of nature's laws should be freely available to all with no restrictions of any kind.

Several years ago, in describing the patent policies of the National Science Foundation to one of the Senate subcommittees, I observed: "The nature of basic research is such that the possibility of patentable inventions resulting during the conduct of such research is very limited. It has been stated from time to time in judicial decisions relating to patent matters that a conception of the mind, not represented in some physical form, is not an invention within the meaning of the patent laws and that patents are not granted on discoveries of abstract laws or principles that can be awarded only with respect to the embodiment of the concrete idea, whether such embodiment is a device, a product or a process. Since basic research is concerned primarily with the study of natural phenomena and the ascertainment of natural laws and principles, the prospects of patentable material being contained in such research are not very substantial, particularly patents having commercial value. I hope you won't hold it against us that we are not too much involved in patents. We do appreciate their importance nevertheless.

Despite its emphasis on basic research, however, the Foundation has subsidiary responsibilities which I believe are relevant to a discussion of the patent system. One of these is the collection and analysis of data relating to the nature and growth of the national research and development effort; and another is a continuing concern with problems relating to the more effective storage and dissemination of scientific information. It seemed to me, therefore, that we might properly ask whether the patent system in its present form is keeping pace with the progress of research and development, and whether we might profitably apply to the operations of the Patent Office itself some of the new tools that technology makes available.

It is fashionable nowadays to relate everything to the technological revolution; hence, I have chosen as my topic, "The Patent System and the Technological Revolution."

We Americans are fond of subjecting to endless analysis and discussion even our most highly respected institutions. Obviously the world in which we live today is much further removed from the world of 1790 than the mere lapse of time would indicate. For example, we are told that more scientists and engineers are living today than in all other ages combined. It is all the more remarkable then that in the still largely agrarian economy the Founding Fathers should have had the foresight to provide for the establishment of a patent system that would stimulate and encourage growth of an industrial society. We salute, also, the orderly instincts that prompted the revision of the patent system as early as 1836 and the passage of the Act that charted the course of its operations for the next century and a quarter. In the last two decades, however, there have been many increments of growth in the economy as a whole; and research and development, to which the patent system is so closely linked, have multiplied at a rate much faster than at any previous time.

The National Science Foundation, in a program of comprehensive studies made on a periodic basis, attempts to measure various aspects of the nation's scientific effort. Beginning with the year 1953, these studies have yielded trend data on the total number of scientists and engineers engaged in research and development and on expenditures for the performance of research and development by industry, the Federal Government, colleges and universities and other non-profit institutions. Data on science and engineering in the United States for the years prior to 1953 are fragmentary but can nevertheless be used for the purpose of drawing broad comparisons be-

tween present and past levels of research and development activity in our economy.

The growth and importance of the research and development activities of scientists and engineers during the last 30 years is demonstrated by the nearly eight-fold increase in the numbers of scientists and engineers engaged in such work—from 50,000 in 1930 to 395,000 in 1960. The most spectacular measures of the growth of research and development during this period, however, are those relating to expenditures. The best available estimates indicate that less than $200 million was spent for research and development in the entire country in 1930, compared with 1960 outlays totaling approximately $14 billion.

In contrast to the tremendous increase in the volume of R & D activities characterizing the Post-World War II period, the numbers of patent applications and of patents granted for inventions have not varied appreciably during the period. The number of patent applications has increased from the Post-World War II low of 65,000 in 1951 to a high of 84,000 in 1960 . It is interesting to note, however, that the number of patent applications reached a peak during the 1920's. During the ten-year period ended in 1930, patent applications averaged 89,000 per year compared with annual averages of 70,000 during 1931–40, 69,000 during 1941–50, and 79,000 during 1951–61. The number of patents issued for inventions was highest in 1932. In this connection, one might wonder whether or not there is any relationship between depressed economic conditions and inventive ingenuity. During the ten-year period ended in 1940, patents issued for inventions averaged 44,000 per year, compared with 31,000 per year during 1941–50 and 43,000 per year during 1951–60.

One must approach with caution, however, the seemingly anomalous situation in which tremendous increases in scientific research and development are accompanied by relatively small increases in the number of patents granted for inventions. During recent decades, patented inventions have increased enormously in scope and complexity. There are more comprehensive applications from large firms and fewer from individuals.

It is a pity, incidentally, that funds have not been provided for a patent museum in which the models for patents that were once required to accompany applications could be publicly displayed, and an even greater pity that many of these models were completely destroyed in a disastrous fire. Otherwise, one might be able to see with his own eyes how American inventive genius has advanced from the simple to the complex.

In the "attic" of the Patent Office, a few of these models survive. There is a model of a "corpse cooler," for example, consisting of a wicker table of somewhat macabre shape; there is a walking cane embellished with a coiled serpent, the American Flag and Holy Bible and more elaborate models of steam engines and early reapers. When one compares these objects with the electronic data system for processing bank checks at a speed of 750 per minute, for which the 3,000,000th patent was issued in September, one gains some notion of the progress of technology. There has been a shift, furthermore, from the individual inventor working on his own, to the corporate inventor working as a member of a team of specialists with all the resources of a modern industrial laboratory at their command. I am told that today about 70 per cent of all patents are issued to corporations.

One must also take into account the role of the Federal Government. More than half of the estimated $14 billion expenditure for research and development in the United States is financed by the Federal Government. Much of the federally-financed research and development work is allocated in the fields of aircraft and missiles, nuclear energy and other defense-related fields, and security classification becomes a factor in the number of patentable inventions.

The preponderance of Federal funds in the national research and development effort also raises the point, which is periodically debated, of whether or not the Government should take title to patents that are issued under its research and development contracts. I do not wish to take sides in a controversy in which a vast amount of information and talent have been marshalled to support each point of view. I do wish, however, to emphasize the need for a wise policy with respect to the administration of such patents as may arise from Government-sponsored research and development. Such a policy should take into account the fact the patent system was designed to promote the use of new inventions, and unless inventions are used, the public interest is not served. Obviously, the performance of Government-sponsored research on problems relating to defense, space, and atomic energy, produces incidentally new products and processes of great commercial value. A policy governing their use should preserve industrial incentives to partici-

pate in Government enterprises and insure that scientific information is suitably disseminated. It might be well to consider the establishment, perhaps as a unit in an existing agency, of a central Federal inventions organization which would have the responsibility of devising suitable licensing procedures, and seeing that Government patents are put into use.

To return to the relationship of research and development to patentable inventions, I should like to discuss one or two additional factors that help to explain the apparent lack of correspondence between the growth of research and development and the issuance of patents. In recent years, about two-thirds of the nation's research and development expenditures have been allocated to development. Development includes technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Development frequently involves the utilization of large numbers of scientific, technical and other supporting personnel and extensive materials in the building and testing of models or prototypes. A considerable portion of Federal R & D expenditures is for development in such fields as missiles, atomic energy devices, space exploration vehicles and equipment, and electronic guidance and control systems. It is likely, therefore, that relatively fewer inventions *per dollar expended* result from the development phase of R & D projects than from applied research.

As I mentioned previously, that portion of the nation's R & D expenditures allocated to basic research performance results in comparatively few patentable inventions. In 1960, funds for basic research performance totaled slightly less than 1.5 billion (including capital facilities) or approximately one-tenth of the nation's total research and development effort measured in terms of dollars.

Although the rate of patent applications and patents issued cannot be regarded as a true index of the growth of research and development, nevertheless, I believe it is pertinent to explore the question whether or not the patent system in its present form is going to be equal to the anticipated growth of science and technology.

The National Science Foundation has recently completed a ten-year projection that predicts a steady rise in the number of scientists and engineers and in dollar expenditures for research over the next decade. The number of doctorates in science and engineering, for example, is expected to be approximately double the present number by 1970. The U.S. Patent Office, meanwhile, is operating under much the same systems and procedures that it did fifty years ago. The patent applications have grown in size and complexity and the material to be searched has doubled and redoubled, so that the time required for each search grows commensurately longer. In an age that is characterized on every side by a high degree of mechanization and automation, the individual examiner is for the most part obliged to conduct his searches by what is essentially a primitive manual method. It is reasonable to expect that the advances of science and technology can be applied to this part of the process so that the bulk of the examiner's time can be devoted to the intellectual aspects of his tasks. A mechanized search procedure, properly conceived and executed, would materially reduce the time required for each search, would eliminate the factor of human fatigue and could be expected to "discover remote and previously unobserved connections," thus contributing to the issuance of better patents.

Such a proposal is, of course, by no means new. The problem has been examined and re-examined a number of times and the Patent Office has a research program directed toward the design, construction, and experimental use of mechanized search systems, although it has had neither the funds nor the numbers of personnel for an effort commensurate with the magnitude of the problem.

In 1954 I had the pleasure of serving on an Advisory Committee, of which Dr. Bush was Chairman, which examined the whole question of the application of machines to Patent Office operations. The problem has two major aspects: the physical capacity of existing automatic data processing equipment for storing the vast amount of information involved, and the intellectual task of reducing the information to a form that can be handled by machines.

On the basis of certain arbitrary assumptions regarding the size of each patent, the Bush Committee decided that for the 1954 file of five million foreign and American patents, a mechanical storage capacity would be required for at least 300 billion bits. A "bit," as you know, is a technical term in information theory used to designate a unit of information. Allowance would have to be made for annual accretions, again excluding drawings, at the annual rate of 3,200,000 bits. Storage capacity required for coding indexed entries and other selections of criteria was estimated at around 50

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billion bits for the patent files in 1954. Accretions since 1954 have raised the total number of United States and foreign patents to 8.5 million and the related scientific and technical literature has increased by a much higher factor.

Since commercially available reels of magnetic tape can store up to 100 million bits of information, the 300 billion bits estimated by the committee could be stored on 3,000 of these reels. There are digital computer installations that have libraries of several thousand reels of tape; hence, this amount of storage is now available. New developments give promise of achieving the same amount of storage at less cost in smaller size and with more rapid access.

Having determined that the storage capacity which would be required of an automatic indexing and retrieval system for the Patent Office was realizable, the Bush Committee went on to note: "The creation of a classification and indexing system so that machinery can be effectively used for searching is an intellectual problem of formidable proportions because it involves a diversity of complex subject-matter fields." The Committee recommended an intensive program of research and development within the Patent Office working toward the adaptation of machines to its specific and unique problems.

In the six years since the Bush report was submitted, the Patent Office has established a mechanized system for the searching of steroid patents and similar work is under way in the field of polymers, chemical processes, organic phosphates and electronic arts. It has logically begun with the arts that are simplest to adapt to machine processing, on the theory that as the work progressed, rapid advances in the development of automatic data processing equipment would provide increasingly sophisticated equipment for the more complex subject matter.

We congratulate the Patent Office on the excellent work that it is doing in this area, but I believe it is fair to say that a greatly expanded research and development activity is needed if the work of mechanizing the search procedure is not to be outstripped by the rapid accretions of the material to be searched. This expanded research program should, of course, be closely related to other current work being done in the broad field of information retrieval.

The National Science Foundation has a special interest in the Patent Office problem because it represents in microcosm the whole scientific information problem for which the National Science Foundation has direct and continuing concern. The volume of scientific information is increasing at an exponential rate which makes it impossible for the individual scientist to keep abreast of the published material in his own field and in related fields in which he may be interested. There are great problems of storage, retrieval, dissemination and translation from one language to another.

An increasing amount of research is being devoted to these problems, which is regularly reported by the Foundation in a semi-annual report entitled "Current Research and Development in Scientific Documentation". This research is primarily concerned with the handling of information in language and other non-quantitative forms such as photographs and circuit diagrams as distinguished from quantitative forms or numerical data. The latter can be quite readily coded, stored, and manipulated by widely understood electronic data processing techniques. The mechanized handling of ideas, concepts, and techniques embodied in texts and drawings present much more difficult problems and these are yet to be resolved.

To illustrate the scope as well as the interest of some of the work that is being done in documentation research, I cite a few examples. The Ramo-Wooldridge Division of Thompson-Ramo-Wooldridge, Inc., and the International Business Machines Corporation are attempting to devise automatic indexing and abstracting techniques. Research groups at the University of Pennsylvania and the Radio Corporation of America are concentrating on the mechanization of certain techniques of linguistic analysis of English, with the thought that such analysis will prove to be an essential step in automatic indexing, abstracting, and retrieval. The National Bureau of Standards is engaged in research on the mechanized processing of both language-texts and pictorial and other forms of graphic information. Ideally, an information processing system should be able to handle both types of information, for they are usually encountered together in scientific papers and in patents.

Western Reserve University has developed partially mechanized information retrieval procedures which are being tested in the field of metallurgy. A group at the Itek Corporation is doing research on a special documentation language based on logical principles and a systematized technique for indexing the concepts and relationships in scientific papers. The British Association of Special Libraries and Information Bureaux is in the third year of a con-

trolled comparative study of the searching effectiveness of several indexing and classification systems. The Chemical Abstract Service, using existing equipment and techniques, is experimenting with ways of coding data on the structure and properties of chemical compounds for mechanized storage and retrieval and for automatic preparation of data compilation.

In the field of mechanical translation, about a dozen research groups in the United States are preparing automatic dictionary machine programs for a number of scientific fields, devising machine programs for the grammatical analysis of certain foreign languages, working on techniques of semantic analysis and on the synthesis of English sentences—and, in general, are gaining deeper insights into the nature of language.

Although the foregoing gives only a hint of the present scope and objectives of research on information retrieval, a great deal more remains to be done before we know how best to use machines to aid the handling of information and patent searching.

Nevertheless, the expected consequences of such research are of the greatest importance for science and industry. Improvements in the means for consulting the records of accumulated scientific knowledge will certainly benefit researching of the patent records.

In the meanwhile, the backlog of unsearched patents remains constant, the elapsed interval of time for the granting of a patent has increased and the over-all number of items in the patent file has almost doubled. A little over a year ago, IBM estimated that industry was spending about $2 million a year on systems for information retrieval and that by 1965 the expenditure will jump to over $100 million a year and will double every three years thereafter.

The Patent Office has been among the pioneers in research on the use of mechanized search techniques, but like others active in this field, has not yet been able to devise ways of using to the fullest the capabilities of the remarkable electronic devices produced by our advanced technology. If the Patent Office were to be given the funds and the staff to tackle this problem on the broad scale warranted by its importance, it would not only enhance the efficiency of the patent system but it would undoubtedly contribute in a major way to the solution of scientific information problems which are of pressing importance to industrial research, and in fact to the scientific community as a whole.

Before closing, I should like to say a few words about even broader needs for research and data relating to the patent system. Although we are here to pay tribute to the patent system and to contributions it has made to progress in the last century and a half, we cannot close our eyes to the fact that the system is frequently subject to attack and the suggestion has been advanced from time to time that it might be eliminated entirely.

In June of this year, The Division of Engineering and Industrial Research of the National Academy of Sciences-National Research Council sponsored a symposium on The Effect of Patents on Research. Members of the symposium were drawn from big business, small business, the universities, economics and patent law. During two days of intensive deliberations, these people who are well informed on the subject of patents, contributed their experience and point of view to discussion of the problem. The report of this committee has not yet been published and I do not wish to anticipate its findings. I think I may say, however, that the group agreed that although the merits of the present system have been debated pro and con, careful study is required before changes other than administrative or procedural should be considered. The group further agreed that our nation's technical progress could be seriously affected by ill-considered action that might disrupt present incentives and methods of information dissemination.

This conclusion emphasizes, in my opinion, the need for much more research and study on the patent system as a whole and its effects upon the economy. To date relatively little has been done in this field. The rapid advance of computed technology has made possible, among other things, the construction of models for the study of complex, socio-economic situations. Through its Social Sciences Division, the National Science Foundation is supporting several studies on the economic aspects of inventions and on the economic implications of research and development. In addition, we have a specific contract for the study of factors affecting the diffusion of innovations in industry. May I say that the Foundation would welcome additional sound proposals in these fields where clearly much study remains to be done.

It is my personal opinion that by and large the patent system has served us well and it has been a considerable factor in the growth of the inventiveness and ingenuity for which as a nation we are famous. We are, however, in the midst of a tech-

nological revolution in which the character of invention seems to be changing rapidly. Whether the patent system as we now know it can continue to serve adequately the needs of an expanding research and development effort and enable us to meet foreign competition successfully is a question that cannot be answered because we lack sufficient data.

In any event, it is timely to apply to an assessment of the patent system the orderly processes of research, and by all means to place on the most modern basis possible the techniques of patent processing so that we may enjoy the maximum benefits of a system that has long been a bulwark of free enterprice. (Standing ovation.)

Commissioner Ladd: Dr. Waterman, we are most grateful to you for your thoughtful, penetrating discussion.

It has been a wonderful evening, good-night to you all. (Applause.)

(Whereupon, at ten twenty o'clock p.m., the meeting adjourned.)

Fourth Session

Friday Morning, October 20, 1961

The fourth session of the Celebration was held at the Sheraton-Park Hotel under the auspices of the American Patent Law Association. The session consisted of simultaneous meetings of several standing committees of the Association which were attended by guests who joined in the discussions.

The Committee on Chemical Practice of the Association was chaired by Mr. John T. Kelton who defined the activities of the Committee to include consideration of pending legislation and to propose changes in the practice relating to or having a bearing upon inventions in the field of chemistry, the drafting of proposals for change therein, and collaboration and co-operation with the Patent Office in all phases of the prosecution of patents in the chemical field. In accordance with these objectives, reports were given and discussion was held concerning Senate Bill S. 1552, a proposed practice in the Patent Office relating to the deposit of microorganisms, a proposal to require definitions used in a specification as filed be made consonant with related prior art and a proposal for the publication of decisions in abandoned applications.

The Committee on Government Patent Policy was chaired by Mr. Martin E. Hogan, Jr. who commented on the necessity for constructive suggestions being formulated by the Committee in advance of proposed legislation. The Committee was addressed by Commissioner David L. Ladd who described the co-operative efforts of the Bar Associations, industry and the Department of Commerce in drafting legislation which could be proposed to Congress and which would provide fair and equitable disposition of rights to patents on inventions conceived under research and development contracts financed in whole or in part by the Government. The Commissioner suggested the probability of enactment of legislation providing for a uniform policy which could be adapted to the needs of all government departments or agencies which entered into such contracts.

The Committee on Patent Legislation was chaired by Mr. Leonard B. Mackey. The discussion in this Committee centered on H.R. 9315 which would give an applicant the option of merely signing the oath under penalty of perjury.

The Committee on Public Relations was chaired by Mr. William F. Thornton. The theme of this Meeting may be expressed by the quotation: "The initiative of the inventor is the course of all progress." Various methods for disseminating this truth were discussed.

The Committee on Relations with the Patent Office was chaired by Mr. Richard C. Sughrue. The following topics were discussed: (1) the cooperative efforts between the Committee and the Patent Office in investigations of the problems relating to terminology and technical definitions and in the progress of mechanized searching activities; (2) the proposed change in the Rules of Practice regarding the publication of decisions of the Board of Appeals concerning patent applications not open to the public; (3) the practice under Rule 52(c) of the Rules of Practice and (4) the practice relating to retroactive licenses for filing applications in foreign countries.

The Committee on Trademark was chaired by Mr. Gerrit P. Groen and was attended by several Officials of Foreign Patent Offices and of the U.S. Patent Office. General discussions were held on recent developments in trademark practice and procedures and on legislation pending before the Congress.

These Committee Meetings adjourned at 12:00 noon.

Reception and Luncheon

Friday Afternoon, October 20, 1961

A Reception and Luncheon was held at the Sheraton-Park Hotel at 12:30 p.m., under the auspices of the American Patent Law Association, Mr. John Rex Allen, President, presiding. Mr. Allen introduced General John B. Medaris, U.S. Army (Ret.), President, The Lionel Corporation.

General Medaris: I am indeed honored to appear as a speaker before this influential organization. I am here to discuss a doctrine for technological growth, and I should forewarn you that the particular doctrine which I espouse requires that you assume a degree of responsibility for its success. That will also be a part of my purpose—to suggest that you, individually and collectively, can exert a very positive influence on the growth of national technology.

I should like to begin by considering why the lowly individual is, or should be, concerned with technological growth. In answering this question, let us look to the individual's basic conflict—his struggle to achieve and maintain a position of respect and comfort and safety in the society of which he is a part. In spite of all the variegated shadings of political division—of "isms" and empires and so forth—the essential element of society is the individual, and as long as he is worth anything he is going to be concerned about his place in society. Remember, I qualified that by saying, "As long as he is worth anything." When the individual stops worrying about his position in his society, he has fallen victim to the philosophy expounded centuries ago by the man who said that eighty-five per cent of mankind was born to be slaves, because it is easier to be a slave than to be free. And this, in my mind, is our basic challenge today. This is why nobody wants to shoot Santa Claus. The prerogatives of slavery are being clothed, fed, and housed, at least after a fashion, and the prerogative of not having to worry about these things.

The penalties of freedom are that you do have to worry about these things—they are your responsibility, and this isn't easy. In fact, in the whole gamut of human relationships and experience, bringing one's self to the acceptance of responsibility is probably the most difficult thing to achieve. Once you have learned the knack of accepting responsibility, it becomes a natural aspect of your character and thinking. But responsibility is easily avoided these days. Now, we are interested, individually, in our position in society, ergo, we should be interested in any force which has substantial bearing on that position. It is my conviction that technology has such bearing on us individually. Indeed, I am convinced that our very survival as a free nation of free individuals is dependent upon our technological growth.

The image of the United States—objectively considered—is a composite of all the things that are done by us and by our Government, inside and outside our borders. Our image abroad is not necessarily what we think we are; rather, it is what other people think we are. The image of a nation, a family, a club, or a profession is the total of all things that have gone into the awareness of the beholder—into that incredible memory device we call the brain. That memory device works by itself. It doesn't have to be programmed like a computer, and many times it will give you an answer that you haven't asked for. But what it gives you is not the process by which it arrived at the answers. It just says, "Hey, look out!" Now, in the same sense, the world's people have their impressions of us and our society as a composite of all the things concerning the U.S. that have gone through their heads or past

their eyes over a period of years—including our technological accomplishments.

Since we are exploring the bearing of technology on society, we then come to the obvious point that we must be concerned with it ourselves, as individuals.

Now, I know that some of you are concerned with technology professionally, but I will begin this by putting that part of it aside, asking you to consider that we must be concerned with it as citizens of a society, regardless of your particular field of professional activity.

Technology is not new. Throughout the ages any nation's position has been influenced—in fact, drastically influenced—by its technology. We get egotistical these days. We get to thinking that technology is new. We put a span of activity on technology. Because it has so drastically changed in the last 20, 30, 40 years, we assume that the man who rode horseback and went into battle with a spear was not concerned with technology. The fact is that he most certainly was! And in terms of that day, technology was equally important. Technology, for example, moved the Carthaginians onto the ocean, and made them a primary seafaring power because they had a compass. Maybe they didn't know why it worked, but they had a compass.

When it came time to fashion metal into armor and weapons, the technology that produced the toughest armor at the lightest weight had a positive predominance on the battlefield. And then some wizard came along and invented the cross bow, and that put a period to the knight in armor.

But this was technology also. From there we can talk through the whole business of the battering ram, the sling and catapult, and gunpowder. They were all products of technology—all results of the technology of their time. Each was just as important as anything we can do today. Technology has always had an important influence on the standing of a nation, commercially, militarily, *and* culturally.

Today, of course, that influence is much more obvious, as we move through the era of the original iron-clad monsters at sea, and then to submarines and longer range artillery, and on to aircraft, and radio, and radar, and missiles, and atomic destruction—and what are we going to do with space.

The increase of technology is on an exponential curve. It is there logically and necessarily, because the broader our base of understanding the easier it is to add some more to it. The more we know about the basic natural laws, and the more we know about how to tame them, the faster we can make another jump. It is for this reason that there has been packed more technological progress into the last fifty years than was achieved since the dawn of history. It is a steeply accelerating exponential curve upward, and there is no reason to believe that this trend will diminish in its accelerating effect.

However, I started you with the premise that technology has always had an influence. It becomes necessary then that we evaluate this influence today—that we understand what there is about it that influences our position—and perhaps think about what we should do about it.

Now, let's look at one of the things that has happened in the military field as the result of technology, that has, in fact, changed the whole basic structure of military power. It has not been until the last 15 or 20 years that one could challenge the validity of an age-old military principle which stated that manpower was the root of all military power. This statement referred to sheer numbers, not quality. Historically, any nation that could amass manpower in overwhelming numbers could, in the last analysis, overwhelm a nation or a group of nations that could not stand the gaff of heavy losses of men.

Now this fundamental structure has been completely changed by mass destruction weapons. In fact, it has been changed to the point where the very power factor of massed manpower may become a detriment. Thus, we must reexamine all of military technology against that basis. All of military tactics and all of military strategy must come under severe scrutiny—because this development cancels one of the fundamental elements considered the most important to military power: the number of people of military age and proper physical condition that could be taken into the field was for many, many years one of the primary elements with which a general staff worked in evaluating military power of their own and competitive nations. This does not mean, however, that there is a change in the importance of *manpower* if you use the broad term. It simply means that quantity must necessarily give way to quality. We may have no use for the phalanxes of charging soldiers that were a factor of war as late as World War I, and that sometimes almost became a factor in World War II. We may have no need for those, but we place a far greater demand on the quality of *each* man who participates in a military enterprise.

The quality requirement is up for two reasons: many more perhaps, but two major reasons. One is the fact that today's instruments of war require intelligent management and direction. These new weapons are not the club and axe of the cavemen. With those in his hand he was free to lay about him with lust and abandon whenever he saw anybody he didn't recognize. Man has gone far beyond that and the instruments he has developed require highly intelligent direction.

There is no such thing as a mechanical brain nor will there be any such thing as a true mechanical brain. Why? Because the intelligent direction of activity based on the evaluation of the situation of the moment—the chess game, if you like, of either warfare or commerce, requires that human element of imponderable judgment that you cannot build into a machine. The premium on human judgment in a technological age goes up and not down. The ability to direct the machines that have been devised comes at a higher premium than it did before.

The second important reason why quality must supersede quantity is because the very conditions of warfare, whether it be cold or hot, of commerce, of technology and of industry have changed. The plodding march from step to step has given way to the supersonic move to the next objective. On the battlefield, dispersion must take the place of massing. What does this mean? It means that when you're fifty yards away from the next man you're your own boss. What does being your own boss mean? It isn't a privilege, gentlemen, it's a responsibility. You've got to boss this guy. Sometimes you don't worry about it, you let someone else boss him. And that's easy. But the minute you begin to spread out and move faster, whether it be in technology or industry or the military, you must necessarily assume more responsibility yourself because you are not in a close-packed group that is being nicely and methodically directed by one man, where you can say the heck with it, it's up to him and if he makes a mistake that's not my fault. You have to say, if I make a mistake it is my fault and I may get killed for it. Therefore, better quality is demanded from that standpoint. Thus the underlying move that has resulted from advanced technology is the substitution, the required substitution of quality for quantity. Let us not forget that as we deal with the subject, because manpower in quality terms is more important than ever before.

Now what else has happened by reason of this accelerated rate of technological growth? And I'm not just talking about our growth here in the United States, but in the world in general. Let's look at the question of weapon effectiveness for a moment and see where the premiums fall in that field. I can remember in my early days as an officer, and in my early exposure to the Ordnance Corps, that the calculations being performed at the Ballistics Research Laboratory at Aberdeen Proving Grounds at that time were expected to result in a principle that could be applied to a new weapon ten years later. If the application was successful, the new weapon might be available ten years later. This was because of the limitations on human calculations, and the limitations on experimental method. Now what happens today? Today that ten years of calculation is reduced to less than ten weeks. It would be less than that if we had a sufficient number of technologically trained programmers in the computing business.

There is an interesting sidelight here. We train programmers in the field of mathematics, not in engineering. Thus, programmers frequently do not speak the engineer's language, nor does the engineer speak their language. As a result, we don't get out of our computing systems what they are capable of giving us. As technology grows, it tends to diversify itself into esoteric compartments, which means that we have an increasing need for people with a broad understanding of technology, as opposed to narrow, highly-specialized understanding. Given the most desirable communication between the engineer and the programmer, we could reduce this theoretical problem that I mentioned to a period of one week instead of ten.

Anyway, we're down to ten weeks from ten years, and once the ten weeks has passed we are limited only by the time required to fabricate, bend, twist, cut metal, and put it together to get a test model. When we're smart and do it right the first time, we come out in two or three years. If we're stupid and don't do it right, first time, we come out in six years. But still it is nothing like the old cycle.

Now, what does this mean in the interpretation of weapons systems for the military for the future? It means that time becomes the critical element in the determination of whether or not a project should be taken on. It means that a given weapon of a given effectiveness, if it can be ready within two years, will exercise a dominant influence in the field of military power, but if it is only ready in

four years it is already down the drain. It is literally useless. This is positive and cannot be stopped. Unfortunately, this also seems to be the area where the least attention has been paid to what happens and why. We take on a project on an optimistic estimate of how long it will take us to do it. It comes through two years later than that. If we had known to begin with that it was going to take two years longer, we shouldn't have started it at all.

One of the outstanding historical examples of this sort of thing is the Navajo Weapons system, which was scrapped after 700 million dollars had been spent on its development. The Navajo program was not scrapped because the missile couldn't be built. It was scraped because at that point in its development time when it should have been completed, the Navajo was only half-way through. Thus, by the time that it could be completed, it would have then been obsolete and useless.

I mention the Navajo only as an example. There are many others, not only in terms of military weapons, but also in terms of industrial products, business ventures, and even in approaches to international relations. The point is that economy and effectiveness are inextricably related to timing, and that with the growth of technology, conditions which determine success or failure change much more rapidly.

If the timing is right, and if you move fast enough, you can expect to achieve success. If your timing is wrong you'd better walk away from the project. We haven't learned that yet, and it is costing us time and money and prestige. We *must* learn. We *must* be able to do that which the machine cannot do—and that is to project our imaginative thinking on a basis of pure logic, far enough ahead to be able to measure the condition as we believe it will exist at the time we can complete a project. Then we must have the courage to say it is good or it is bad, based on that projection. And if we decide it is good, we must then have the guts to put ample resources and determination behind it.

The second thing that becomes of greater importance than in the past as we move from quantity of men to quality of men, and from instruments of individual destruction to instruments of more massive destruction, is the question of what I think has been ably described by a very good friend of mine as a technological casualty. Now we never thought about those 25 years ago. The only kind of casualties we were worrying about were how many men got killed and how many went to the hospital and what it cost to keep them in the hospital. We had it with us then, but we didn't recognize it. Mostly it was in terms of wounded rather than killed, but we didn't have brains enough to know that it cost the enemy more to take care of the wounded man than it did to take care of the one that was dead. Actually, if we had been real smart in our computations, we would have tried to wound and not kill. The man who is the most expensive to your enemy is the man who is out of action for six months, but must be looked after. The man who is dead—he's dead. He doesn't have to be fed, he doesn't have to be clothed, he doesn't have to have anybody to look after him, so he doesn't cost anything. These seem cruel terms, but cruelty is necessary. So we had the business of the technological casualty with us then but we didn't understand it. Too many people still don't understand it.

Let's see if I can define it. Whenever, in the total resources of the country concerned, more of its effort has been expended in the provision of a weapon than is required by the enemy to repair the damage caused by the weapon, you have suffered a technological casualty. If in the sum total of resources available, in this era of weaponry and technology and brain, you have expended more than the other fellow has, you have lost the battle. If you extend the thesis far enough you'll find that you really do lose, not just the battle, but the war. And so we have this second factor in the evaluation of weapons or system effectiveness for the future, and that is the evaluation in the coldest terms of its virtues against its negative factors and an evaluation of what has to be put in it.

We're not going to talk about dollars now, because they're not a measure of strength. What you do with them becomes the measure of strength. But we are going to talk about the fact that in any nation in the world, the total to be used for all purposes is only the total of production of all the people of that nation. Against that background you have just so much to dispose of that you may divide between civilian maintenance, cold war, hot war, aid to others and weapons for your own services. And every time a portion of that is put into a place that costs you more than its use will cost the other fellow, one way or another, you have suffered a technological casualty.

If you accept this swing to technology as a major factor, then you will find that this becomes a second rather new, but highly important criterion. New

because, again, it's associated with the question of manpower. You see, when manpower was the premium gold standard for military power, any means that you used to kill a lot of them was effective. Killing was mathematically, financially, technologically and militarily effective, because you were killing the gold standard of the other fellow. When that is not true, you have to look again, because effectiveness now must be measured in some other way. You must now find a way to measure the effectiveness of the weapon against its cost in our resources in order to know whether that is the particular thing you should be doing.

This in itself points up an odd result of the advancement of technology. You know, as little as twenty years ago, there were more resources with which to latch onto something new and do something about it than there were really new things to work with. Choice then was not a major factor. Anything that came along that could offer you progress, you could go after. Anything that improved what you had was worth doing. Today, this is not true. Today, for every hour of work, every pound of basic resource, every bit of national effort that is available to put on them, there are ten things clamoring to be done, all of which are new or an improvement. So now, we have the unfortunate problem of making up our mind. Selectivity carries the highest premium. And if we do not understand this difference, and make the choices intelligently, we lose.

Now, this brings up a point that I will not push too far, but merely offer for your consideration. It seems to me that some of our more imaginative, unbridled economists tend to believe that the way in which you slice a pie determines how much pie you have. The point I wish to make is that however many pieces you choose to make out of a given quantity, you have not altered the sum of the whole.

In other words, the total resources of our nation and of our friends can be stated in terms of the total of what we can produce. And that is all. You don't need to define it in dollar terms. You can put it in any terms you want to. Put it in horsepower if you like. But the total of what we can produce is all there is to "divvy" up. And as a result of these factors, we now have a very high premium on choice, and a very high premium on timing.

Viewed against this outline, the question is: Is the growth rate of United States Technology adequate to the challenge? And I think here we have to come to this very simple question: What is growth? If you determine the growth rate of technology in terms of how much you know this year that you didn't know last year, then I'm not with you. We have known more for years than we use. Even the fellow who is the janitor or the street sweeper knows more than he uses. And as a nation, for many years we have known more than we have used. Perhaps more than we know how to use.

So progress is not truly achieved until new knowledge is converted into actual accomplishment and that accomplishment made useful. There is no growth until that point is reached.

You must plant the seed to get the corn, so you must have the research, and the exploration. You must also have the experimentation, but until it moves from that into something that can be used—something that can be applied to the power and the glory and the future of this country, you haven't done anything that can be measured as growth. We have seed, but the bank won't lend much on seed, only on a crop. And this is the way we have to interpret our position.

The danger, technologically, lies in that area. The danger to the United States in its ability or failure to measure up in technological growth rests in that area. I once read a science fiction story that is germane here. I use it only to point a moral and adorn a tale, if you like, and let me tell you the nature of this thing. The story concerned the trial of a commander of forces—a sixteen star general, or some such awesome rank. The commander was being tried for having lost a certain galaxy in an inter-galaxial war. He was being prosecuted along with that galaxy's director of research and development, a brilliant theoretician who had developed 99 different ideas about how to win the inter-galaxial war. All of these ideas were sound—all were approaches that were the ultimate in creative, imaginative thinking, far, far advanced beyond anything that the enemy galaxy could dream of. The enemy galaxy was less developed, less advanced, less sophiscated. And what happened? They beat our hero's forces to death with bricks and rocks, because he was so busy trying to follow the ideal program set up for him by the theoretician that he never managed to get one of the weapons programs to completion. When he was half-way through one brilliant scheme, he would be ordered to drop it and pursue a more brilliant scheme, with the result that he never finished one of them. Needless to say he was found guilty. But before he was sentenced he said to the court, "Gentlemen, wherever you send

me, please put me in the same cell with the director of research and development. I want to break his neck with my bare hands". Now what's the meaning? The Russians have a saying for it—the old Russians—"The Perfect is the enemy of the good." And I want you to relate that forever in your mind to the statement that I made before that there is no growth until there is accomplishment—there is no growth in prospect—there is no growth in plan—there is no growth in pure knowledge—until it is used. So, we can only measure the capability of the United States to keep up technologically or be ahead technologically if again we can use that degree of intelligence and foresight that is necessary to make the right decisions as to where we should apply this knowledge that we have. And I remind you again, we and our best scientists and technicians have, for a long time, known much more than they were able to use.

I get amused when I hear some of the discussions about this space business that's going on. Sure, we've got 40 satellites up there. So we make the numbers racket. We say we got 40 satellites up—and the Russians have orbited only 13 or so. Is that the way to measure progress? Is it? If you measure it by how much we know how to do that we have not done, the answer is no. That is not progress. If we take that position we are blind. We must recognize that quantity does not substitute for quality.

Now, we can do it. In my opinion there is no area in which the technological knowledge of the United States is not better and more advanced than anywhere else in the world. Knowledge. In my opinion, there is not anything that anybody else in the world knows how to do, that we do not know how to do. The question comes back to the matter of decision—what to do—and where to put the effort and how fast to put it there—to get it out of someone's head and into some accomplishment. And here we run the grave danger of loving to tinker with gadgets—the danger of being disposed to play with something for a long time and make it a little better. We often fritter away a great share of our technological capability on 2% improvement when that one should be parked. Let's look for the next jump of 50%—as long as it works, we must learn to be satisfied with it. I've gotten into some bitter arguments on that subject, and I lost some of them, but I think logic is on my side. I once argued with a group in the Pentagon that was trying to kill off certain programs—simply because they knew how to make the same thing smaller. And I said, "Look, I can't find any reason to believe that the guy who is going to get hit with it is going to know the difference."

I didn't get any place incidentally, but I still think I was right. I think I'm right today—and I don't think the guy on the other end of the line is going to know whether it is an ATLAS, a TITAN II or a MINUTE MAN, or an X–Y–Z or a what-have-you—when it goes bang, he's not going to know where it came from—and he'll care less.

Now, what I am trying to say in summary to you in terms of a doctrine or a blue print for technological growth can be added up just this way:

First of all, objectives must be far enough ahead that you can turn knowledge into accomplishment as quickly as possible, because until it is in terms of accomplishment there is no progress. Secondly, those long range goals must be propely timed and only on the basis of timing can you effectively use your resources. Thirdly, selectivity is the area of premium because there is more to be done and more that could be done than we have the total productive capability to do and still keep our wives and children clothed and covered. Stop-start planning and programming is the worst thing we can do and it is the one thing we do the most of, unfortunately. It never gets us hardware—it's chasing the will-o'-the-wisp.

In closing, I'm going to tell you a real quick story to illustrate the kind of action I think we need. Back in 1941, I was a Major—a Major in the halls of the great and sanctified Department of the Army—outranked in all directions—in fact I couldn't even find people at coffee call who didn't rank me. There was another fellow about my stature in this hierarchy at that time, and we decided that we had to do something about the Middle East—this was Karachi and the Persian Gulf and the question of getting some things out there to work with—so we decided we were not going to ask anybody or consult anybody, and we sat down in a corner and we drew up a table of organization and a commitment in terms of hardware and total and a calendar sheet, and put them all together and put them in a cute summary sheet and started to peddle the summary sheet. And two little majors being the only people in the Department of the Army who had even seen this document before, peddled it and got the signature of every department staff chief in six hours. In the country of the blind, the one-eyed man is king—and in govern-

ment or business, the prize goes to the guy who just thinks he knows what he is doing and is willing to start doing it. And if he really knows what he is doing, he can work miracles.

Finally , I should point out what I consider to be a particular problem that must be overcome if our technology is to enjoy proper growth. It is this: More and more, leaders, managers, and executives in government, in business and in industry are being required to make intelligent decisions that involve technology. In my opinion, tomorrow's most successful business manager must have a speaking acquaintance with technology, and toward that end I believe that courses in the basic physical science must become a part of business education.

At the outset, I warned that I would attempt to convince you of your own individual responsibility in helping this country go forward in technology. I believe I can do this with the following idea: it is obvious that somewhere along the line—especially in space technology—we goofed. Somebody failed us, and I would suggest that we have failed ourselves. Too many of us had too long assumed that our technological health was under expert guidance.

The cure, of course, lies immediately with government—but eventually and inevitably—our technology growth will be precisely what the public demands it to be—neither more nor less.

Patents were the original method by which ingenuity and imagination were stimulated and technological growth promoted. This is in line with our basic economic system which purports to provide reward for accomplishment. The healthy maintenance of this system so that it will continue to provide economic stimulus is vital to our future. You, here, have a responsibility to see that the purposes of the basic system of patent protection are not distorted by any action which would tend toward the communistic system of government ownership of all patent rights.

Your means of influencing this trend and, therefore, providing sound growth, are both professional and personal—your voice and your vote. I trust you will use them to the nation's advantage.

Fifth Session

Friday Afternoon, October 20, 1961

The fifth session of the Celebration was held in several conference rooms of the Department of Commerce and consisted of panel discussions on Patent Office Operational Problems.

The first discussion group was entitled "Expediting the Examination System". The Moderator was Mr. E. A. Faller, Supervisory Patent Examiner, Division 4 and the panelists were Mr. H. J. Lidoff, Supervisory Patent Examiner, Division 6 and Mr. M. Sterman, Assistant Supervisory Patent Examiner, Division 60. Discussions were held on the following topics: (1) the desirability of limiting the prosecution of a patent application to the originally claimed invention, (2) the feasibility of restricting the patent applications to a single claim with permission to add dependent claims when allowability of the single claim was determined and (3) the propriety of establishing a system of qualifying examinations for attorneys and agents to insure competence in complex fields of technology.

The second discussion group was entitled "Administrative Operations and Personnel Policies and Practice". The Moderator was Mr. W. E. Ingram, Head of the Classification and Wage Branch, Personnel Division, Patent Office. The discussion of this group centered on the problem of internal communications within the Patent Office. Solutions to the lack of proper communication were offered in the form of special bulletins or announcements, the continued use of progress reports to show trend of the work of the Patent Office and the more effective use of bulletin boards for announcements.

In addition to these discussion groups, the Patent Office was open to visitors during the Afternoon of October 20, 1961. Guides were provided and a large group of visitors were escorted through the various areas of the Patent Office. In particular, the Examining Divisions were visited by many Officials of Foreign Patent Offices.

The meetings adjourned and the tour ended at 5:00 p.m.

Guests From Foreign Countries

AUSTRALIA

Hon. Cecil N. Jeffery, Supervising Examiner, Classification Division, Patent Office

AUSTRIA

Hon. Friedrich Lang, Economic and Technical Counselor, Embassy of Austria

BOLIVIA

Dr. Mario Velarde Dorado, Director, Oficina de Propiedad Industrial

CAMBODIA

Hon. Kreng Nill, First Secretary, Embassy of Cambodia

CANADA

Hon. J. W. T. Michel, Commissioner of Patents, Patent and Copyright Office

Hon. F. W. Simons, Assistant Commissioner of Patents, Patent and Copyright Office

REPUBLIC OF CHINA

Hon. S. T. Shang, Director, National Bureau of Standards

DAHOMEY

Hon. Virgile Tevoedjre, Foreign Office Director of Cabinet

FRANCE

Hon. Guillaume M. Finniss, Director, Institut National de la Propriété Industrielle

Hon. Louis Franck, Director General of Prices and Economic Investigations

Hon. André Jean Francois Germa, Ministry of Defense

FEDERAL REPUBLIC OF GERMANY

Hon. Werner Rubach, Director, Deutsches Patentamt

IRAN

Hon. Mehdi Naraghi, Director, Office of Companies, Registrations, and the Industrial Property

Dr. Hossein Bassir, Judge of the High Court

Hon. Kazem Banan, Assistant to the Director General, General Registration Office

JAPAN

Hon. Kotaro Otani, Chief Examiner, Patent Office

THE NETHERLANDS

Dr. C. J. DeHaan, Director, Octrooiraad

Hon. A. J. Bulder, Vice-Director, Octrooiraad

Hon. P. van Waasbergen, Vice-Director, Institut International Des Brevets

NICARAGUA

Dr. Julian Bendana, S., Commissioner of Patents, Oficina de Patentes Y Marcas de Fabrica

NORWAY

Hon. Johan Helgeland, Director, Patentstyret

Hon. K. Ueland, Supervisory Examiner Patentstyret

PHILIPPINES

Hon. Tiburcio S. Evalle, Director of Patents, Patent Office

SWEDEN

Hon. Claës Uggla, Head of Law and International Affairs, Kungl. Patent-Och Registreringsverket

Hon. Tore Oredsson, Bureau Director, Kungl. Patent-Och Registreringsverket

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William Moreland, President, American Society of Tool and Manufacturing Engineers

A. F. Chouinard, President, American Welding Society

Dr. Ralph A. Morgan, President, Engineers Council for Professional Development

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Richard Wagner, President, Chamber of Commerce of the United States of America

Rudolph F. Bannow, Chairman of the Board, National Association of Manufacturers

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Hon. Wilbur K. Miller, Chief Judge, United States Court of Appeals for the District of Columbia

Hon. David A. Pine, Chief Judge, United States District Court for the District of Columbia

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Hon. Arthur F. Goldberg, Secretary of Labor

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Hon. John L. McClellan, Chairman, Sub-Committee on Patents, Trademarks and Copyrights Committee on the Judiciary, U.S. Senate

Hon. Emanuel Celler, Chairman, Committee on the Judiciary, House of Representatives

Hon. Edwin E. Willis, Chairman, Sub-Committee on Patents, Committee on the Judiciary, House of Representatives

Hon. Hickman Price, Jr., Assistant Secretary of Commerce for Domestic Affairs

Hon. David L. Ladd, Commissioner of Patents

Hon. Conway P. Coe, Former Commissioner of Patents

Hon. Lawrence W. Kingsland, Former Commissioner of Patents

Hon. Robert C. Watson, Former Commissioner of Patents

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October 16–November 10, 1962

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AVNET Electronics Corporation—Shaw Process Division
Berko Electric Mfg. Corporation
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Blue M Electric Company
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Clevite Corporation
Cutler-Hammer, Inc.
El-Tronics, Inc.
The Electric Storage Battery Company
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General Electric Company—Computer Department
Heinemann Electric Company
International Business Machines Corporation
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The Lionel Corporation
Servomechanisms, Inc.
Texas Instruments, Inc.
Victor Adding Machine Co.

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PART II

Proceedings of the
International Patent Office
Workshop on Information
Retrieval

Sponsored by
U.S. Patent Office
Patent Office Society
and
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National Science Foundation

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Opening Session

Monday Morning, October 23, 1961

The opening session was called to order at 10 o'clock in a conference room of the Department of State, Washington 25, D.C., by the Honorable Horace B. Fay, Jr., Assistant Commissioner of Patents, U.S. Patent Office, General Chairman.

Chairman Fay: Gentlemen, it is a pleasure to welcome you all here for this International Patent Office Workshop on Information Retrieval. I am Horace Fay, Assistant Commissioner of Patents, U.S. Patent Office.

The purpose of this meeting is, as you know, to consider means of achieving cooperative efforts in attacking and solving mutual problems of information retrieval. Informal discussions, which have been held with members of the staff of some of the patent offices throughout the world over a period of years, have clearly pointed up the community of interest shared by these organizations in the problems of storage and retrieval of technological information. Even where the several patent laws are superficially different from each other, the problems raised by the requirements for making a search of the prior art are remarkably similar.

Although the state of the development of data processing in several countries which have examining systems is not uniform, it is believed that many of these countries can contribute skills and manpower to an international effort. Apart from the common interest in all aspects of information retrieval problems, which the patent offices share with other users of information, the need for deep analysis of the information content of documents, the need for generic searching and the frequent searching for equivalents, lead to specialized problem areas, which may be susceptible to a joint research attack by the several patent offices.

The magnitude of the problems to be solved is such that no single patent office is likely to be fully successful in their solution. However, cooperative work appears to offer a reasonable chance for achieving success. The celebration of the 125th anniversary of the United States Patent Office last week, here, offered an opportunity for convening representatives of the working staffs of a number of patent offices which perform searching as one step in the patent examining process. I think this will outline for us the scope of effort we hope to have during the next few days.

(At Mr. Fay's request, Mr. Gareau, President of the Patent Office Society introduced the visitors from abroad to the assembly.)

Chairman Fay: It is now my pleasure to introduce to you the United States Commissioner of Patents, David Ladd, who will begin our conference this morning. Mr. Ladd.

Mr. Ladd: Gentlemen, it is a great pleasure to welcome you to the Information Retrieval Workshop, and we are grateful to you for coming. I hope, in these brief opening remarks to indicate the importance and gravity that we attach to these meetings. Before I explain generally the problem which has led us to organize this Workshop on Information Retrieval, I do want to express our appreciation to the National Science Foundation which, by its grant, has made this meeting possible, and to thank also Mr. Pfeffer, Mr. Gorecki, Commissioner Watson and others for their efforts in organizing and preparing this meeting.

The importance of this meeting, in my view, lies simply in the fact that the burdens of maintaining an examining system, such as we have in the United States, are steadily becoming heavier. There are several reasons for this. One is, the growing complexity of the applications which are filed. An-

other is the problem of personnel turnover, which is not unknown to some of your patent offices. The third, of course, is what we call the growth of the cumulative search load. Simply it is the growth in that material which must be studied and must be searched to determine whether or not an application discloses patentable and novel subject matter.

The program of research in information retrieval in the Patent Office is, of course, directed to achieving to some degree at least, mechanical searching, to replace with a mechanical search the work which has traditionally been done manually. If we are eventually to achieve general mechanized searching in the Patent Office, this will not only improve our chances of maintaining an examining system and avoiding having it break down under us and compelling us to go to other alternatives, but it should also greatly strengthen the patents which do issue.

As most of you know, by virtue of the examination accorded a patent application in the United States Patent Office, it issues with a presumption of validity. General mechanized searching should also reduce instances in which the Patent Office does not find relevant prior art. It should enhance the legal presumption of validity and consequently it should reinforce public and judicial confidence in the patent system.

In March of this year, a committee, under Dr. Gilbert King, Director of Research of IBM, filed with the Patent Office a report on the prospects of automation in the search procedures of the Patent Office. This report was a sequel and a supplement to the now famous Kelly report which evaluated the functions and operations of the Department of Commerce, including the Patent Office in relation to national scientific needs. That report was prepared by a committee headed by Dr. Mervin Kelly, consultant to the President of IBM. I have, incidentally, brought with me this morning copies of the King report in limited numbers, and they are available here at the head table. If additional copies are needed, we can have them reproduced.

Since the time that the King report was filed, I asked Dr. Allen Astin, Director of the Bureau of Standards, and Mr. John Green, Director of the Office of Technical Services, to conduct another study on our research and development program in the Patent Office and to file their recommendations. Both of these studies have now been made public. This quotation from the King Committee report is directly relevant to the point that I want to make this morning. I am now quoting: "The whole philosophy of the patent system is dependent on the accuracy of the patent examiner's work. Some errors are inevitable; this is no reflection on the Patent Office or its examiners, nor is our recommendation that the error rate be measured. As time goes on, it is quite likely that the rate will go up because the search problem is becoming intrinsically more difficult, although the introduction of information retrieval systems may reverse this trend. If the error rate increases sufficiently and it proves to be impossible to reduce it, then our present patent system will have to be abandoned or seriously modified. The error rate may thus be regarded as important an indicator of the health of the patent system as the size of the backlog and the mean time of application processing."

I can summarize the recommendations and findings of both of these committees briefly, and they are these: Operating under considerable handicaps in a new field, the Patent Office research and development staff, modest as it is, has achieved as brilliantly as any comparable group of workers in the field. However, the Patent Office problem of data processing is as severe as any existing. The work in this field in the Patent Office is of importance to the entire scientific community. It does not presently lie within our capacity to conduct the exploratory research necessary to achieve any longrun and general solution. A judgment must be made as to whether the Patent Office is willing to carry a disproportionate burden of the research in this field. There are strong reasons why it should. It starts with the most sophisticated system of classification of technical materials available. It is faced with its own immediate and pressing problem, the solution of which is, in fact, indispensable to the survival of the examining system as we have known it. It has a highly qualified cadre of technical people. And finally, it represents an unparalleled opportunity for costing out new systems as developed by comparing the efficiency of manual searching and machine searching.

Let me emphasize that the solution is not in sight and we are very well aware of it. And I can emphasize this point further by quoting to you from Dr. Astin and Mr. Green's letter to me of July 14, 1961. And again, I quote: "Confirming a point stressed in the earlier reports that barriers to mechanization lie in theory rather than in technology, we must emphasize that many years of concentrated research effort will be necessary before a significant impact on the Patent Office search problem can be achieved.

Consequently, it would be unrealistic to expect major reductions in the Patent Office backlog from mechanization within the next few years."

It is my judgment that the Patent Office must accept this challenge. It must do so, for the very survival of the examining system as we have it is at stake, and because of the unique contribution which the Patent Office can make to the scientific community and to the country and to the world. For fiscal year 1961, the American Patent Office has budgeted a little over $500,000 for research and development work. I think that you will agree that this is a modest sum. We actually spent only $460,000 of that appropriation. For this fiscal year we have budgeted $580,000. The Astin-Green report, which I have just quoted to you, envisages an annual program of about $3 million. That would be about 12% of our entire budget for this fiscal year, which itself is at an alltime high. Of course, I must explain to you, as I am sure you understand, that before the recommendation of the Astin-Green report can become reality, those appropriations must be approved by the Department of Commerce, the Bureau of the Budget and the Congress.

The Astin-Green report also recommends the appointment of a third assistant commissioner whose sole responsibility will be the direction of research and planning. We have now located that man and his appointment will be announced within the next few weeks.

While this problem of information retrieval and mechanized searching is our greatest challenge, it is also a splendid opportunity, for it means that the Patent Office of the future will promote innovation not only by securing rights in industrial property by the granting of patents, but will also become increasingly a center for the dissemination of technical and scientific information. And on this point again, I wish to quote at some length from the King report.

"The problem (of information retrieval) is, of course, a general one throughout science and technology and particularly worthy of attention for that reason. In the seventeenth century there were men who kept abreast of all science, but today even the fragments into which all subjects have been split are vast, and a scientist is hard put to keep up with the research published on a small segment of a single field. In spite of the growing number of information services, information gaps become more prevalent and more difficult to fill. Mathematicians have been known to work out a theory from scratch rather than attempt to find it in the literature; a chemist will devise a new synthesis rather than search the journals; a physicist may perform an expensive experiment rather than look for previous work on the subject. It could very well be true that more than half the effort of the scientific and technological personnel of the world is now being spent in a duplication of previous effort. If this estimate is correct, then an efficient method of making knowledge available would double the effectiveness of the scientific community.

"It is interesting to note, in returning to the Patent Office problem that its relationship to the general problem of access to scientific and technical information has a historical basis. One of the primary purposes of the patent system, as originally devised, was to serve as an information clearing house. Unfortunately, this latter function has all but disappeared." There might be some who would take some exception to the last remark.

"That steps be taken towards mechanization is dictated, of course, by the sheer quantity of the material to be searched. There is little question, however, that the effectiveness of very high-speed, mechanized searching procedures will depend on the formulation of adequate searching and retrieval theory. The Patent Office has quite properly set up an Office of Research and Development to study the possibilities of obtaining mechanical or electronic assistance. This office has a number of excellent research contributions to the general problem of retrieval and has started a number of small-scale projects to help the searchers in particular areas. One of these projects, the steroid chemistry file, has already proved valuable not only within the Patent Office but also to the drug industry as a whole. It is well worth noting that one of the reasons for the success of this project is its contribution to the forgotten clearing-house function of the Patent Office alluded to above."

These remarks, and especially these quotations, I think, underline the importance which we attach to these meetings. We welcome your cooperation. This obviously will not be a short-run job. It will last for years. But we must get started and we must expand our work. At least, the American Patent Office must expand its work strongly in this field in the years ahead.

It is now my pleasure to introduce to you the man under whom the Patent Office commenced its work in this field. He is well-known to all of you

and no elaborate introduction is necessary. It gives me great pleasure to introduce to you Robert C. Watson, the former Commissioner of Patents.

Mr. Watson: Mr. Commissioner, Mr. Assistant Commissioner, guests from countries other than our own, members of the Patent Office staff and others. It gave me great pleasure to hear your Commissioner speak as he did, giving us all assurance that the vital study which has been undertaken will be continued and augmented. It is not exactly factual, however, to say that I initiated the study. I had a predecessor who initiated a study of similar import. Unfortunately, however, he decided that the effort was not worthwhile and discontinued it. Perhaps my early interest was stimulated, in fact I am sure it was, by a suggestion which appeared in a printed report of the Senate Committee on Appropriations in 1954. I read that report one day and established a committee the following day. The Commerce Department also took prompt action, Dr. Vannevar Bush being appointed head of a committee to consider the search problem of the Patent Office and to make recommendations. That committee functioned for a number of months and rendered a report, copies of which, I suppose, are still available for those who are interested. The report recommended strongly that the Patent Office, in conjunction with the Bureau of Standards, as the Commissioner has pointed out, should proceed vigorously to do various things.

One was to speed the classification effort so as to bring about the earlier classification of the large backlog of unclassified patents in our Office. And the second one was to develop a system to search the chemical patent literature as soon as possible. That, and other recommendations, we implemented as best we could. As the Commissioner has pointed out, very considerable progress has already been made which is of value not only to the Patent Office, but to the whole of industry.

You gentlemen are all here because you know that the success of the effort to mechanize patent searching must succeed if we are to maintain our examination systems. Perhaps I can say that, as one of the older lawyers engaged in patent practice, and who came into that practice through the search-room door, that we have in this country, and there exists in every examining country, a system which, to my way of thinking, may be appropriately designated a manufacturer's patent system. We issue patents only after the applications therefore have been most carefully scrutinized so that the manufacturer who studies them knows exactly what they mean.

I imagine that everyone of you has visited our search room and seen there engaged in inspecting patents, on an average day, between three and four hundred people. The search room is wholly inadequate. We do not have enough seats. Repeated polls of those who are engaged in searching in that room have disclosed the fact that a very considerable proportion of them—as I recollect it, somewhere between 50% and 60% of those searching—were either studying the claims of unexpired patents for the purpose of ascertaining the scope of those claims or were trying to find anticipations of those claims. In other words, they were engaged either in infringement searches or in validity searches, both of which make necessary the study of the precise wording of the claims. As a result of these studies, advice is communicated to the manufacturer, or the prospective manufacturer. It is thus clear that the accurate and painstaking processing of those claims is essential to the success of our system. That is the reason why we spend so much time in the examining divisions in searching through the prior art and in the consideration of the precise wording of the claims. If a reference is missed, and as the Commissioner says sometimes it is, that is unfortunate and can lead to all kinds of economic loss. So, it is important that the search be complete.

When I first entered the patent field as a young searcher in my father's office, and worked in the search room of the old Patent Office there had been issued only a little more than a million United States patents and there were then considerably fewer foreign patents than are now in the Patent Office files. The books of reference and the magazines which have been published since then would probably fill all the rooms in the State Department building. Technological publications are piling up at an increasing rate and the disclosures become more and more complicated. And, as the Commissioner said, the complications increase.

To continue a little longer in retrospect, while I am not going to take much of your time, I will add that on some of the searches which I made in important cases, I would spend a long time. I sometimes found that the Patent Office files were not complete. I would search through all of the pertinent patents, examine all of the likely looking books in the library, and would then be left out on the limb, so to speak, not having been able to produce the desired anticipatory matter. And on one occasion I can recollect going to the Bureau of Stand-

ards library and discovering there in a textbook a reference to a solution of a problem in gear cutting, which was what I had been looking for all through the Patent Office and did not find. And another time I searched the entire Patent Office with no fruitful result and then wandered over to the Bureau of Public Roads and found the sought after information in one of their little publications. Another time I found that the Congressional Library was the best place to search, going into their stacks by special permission and pulling down books one after the other. Now if we are going to have a system in this and in other countries, of efficient examination, some mechanism, some procedure, some method of assembling the information which is contained not only in patents but in publications, must be devised. And that system, of course, must be one which can be tapped. There is no use in accumulating such technological information if you cannot use it. So that is your problem, gentlemen. I know that it is of great interest to each of you who come here from abroad, because in my visits to Europe, I have made inquiry as to your interest, and I know that it exists. I am sorry that by reason of the fact that there is another conference now taking place in Rome, some of the other patent offices are not represented here, their representatives having gone to that meeting. I have met with the greatest cooperation in my travels from those employees of other Patent Offices who were studying the problem which we are to discuss today. I have tried to work the British system in the British Patent Office, the punch cards and so on, without much success I can say. I know that the need to improve the search system is well understood in London.

Gentlemen, I will close by wishing you well, and by expressing the hope that this meeting will be a most fruitful one. As the Commissioner said, this is not a problem which the United States alone can solve. We need the cooperation of all our friends. We well know that in Europe and in other countries of the Free World, there are many extraordinarily well-versed, knowledgeable, scientific minds which can be brought to bear on this problem so that, by the exchange of information between those here in the United States and the knowledgeable persons in various other countries which are friendly, and interested, we can solve the problem eventually. It may take quite some time to accomplish our objectives and I think we should not be engaged in this effort under the impression that it can be solved in any great hurry. But we have already made progress, and I am sure that some day we will have the answer. Thank you very much for having listened so patiently.

Chairman Fay: Mr. Watson, I want to thank you and Mr. Ladd very much for this fine introduction to our workshop.

I wish you would examine your programs, if you have not already done so and see the subjects that are coming up. You may wish to add to the program after you have had a chance to study it and see what other matters you would like to discuss. Now I want you to know that this is your meeting. This is your workshop, and we will be glad to take up any order of business you wish.

Before we adjourn for a few moments, I would be very pleased to entertain any suggestions you might have as to topics you might like to add to the agenda or things that you would like to discuss when we return here at about 11:10. Are there any suggestions? If there are not, we will adjourn until 11:10. I would suggest that you introduce yourselves to each other and begin any discussion that you would like to have with each other, and then we will come back and see what comes of it.

A short recess was called by the Chairman.

Chairman Fay: We have some slack in our program this morning. Therefore we did a little extemporizing and came up with this suggestion. We would like to outline the problems, or some of the problems facing the U.S. Patent Office. We have heard from Commissioner Ladd and from former Commissioner Watson as to the nature of the problem, and I would now like to call on some representatives from our office to set forth, in a small way, some particular problems, so that we may understand some of this challenge in a little greater depth. Then after hearing from these people, it may be that some of you from other countries or from business or from universities would like to outline to us your problems. We have hastily looked about and would like to invite Mr. Irving Rotkin, a Patent Classifier in Division 93 in the Patent Office, whose work involves metal working and the mechanical arts, to give an impromptu discussion of some of the problems. Mr. Rotkin.

Mr. Rotkin: I have just scribbled seven lines of notes so I can assure you it will not be too long. The search problem that faces an examiner in the Patent Office, as well as someone searching for an attorney or for an inventor, is formulated by the claim. As it is the claim that determines what an inventor gets

when he receives a patent, the claim is the yardstick and the measure used in weighing the patent both in application form and as Letters Patent. Thus, when a man is searching in patent files or literature, it is a claim or claims, that he is trying to find. The statutes in this country require novelty, utility, and inventiveness. Utility however, in general is not something one searches for, and it poses no search problem as such. Novelty, which is the primary thing we search for, has several aspects that I think are of interest.

For one thing, entry into our classification system is determined in part, by the way an item is set forth. For example, take the ashtrays that are on the tables in front of you. If that is what is named in the claim, you have a hint. You are going to look for a new ashtray. If one does not call it an ashtray, but calls it a receptacle, you have a slightly different problem as to where to look and how to go about it. One may not call it a receptacle; it may be called a paper weight. The fact that it looks like an ashtray and can be used as an ashtray is a hint to an alert searcher as to how and where he can get into our system and start looking for similar structures. He may look for it by name or by what his senses tell him it may be used for. For example, there are ashtrays and paper weights that, at least according to detective literature, have made excellent weapons (though I would not recommend searching the weapon art for an ashtray). I merely cite this to indicate that there are many ways of getting into a related classification area for searching.

In terms of novelty, the question is are you going to find an exact copy—an exact duplicate? Are you going to find differences? How far will you go in accepting these differences? In the United States patent system the statutes permit very broad terminology. The device or item can be claimed in terms of means; i.e. a broad means to accomplish a particular function. This requires a look into the concept of equivalents, and again it is a search problem in the sense of how far afield one will go for an equivalent. If a claim reads "means to secure", what is a reasonable equivalent? Where a nail has been shown, is a screw a reasonable equivalent? When is a screw not a reasonable equivalent? This will depend upon the utility aspect, which itself is not a search problem, as to whether a screw is a proper equivalent for a nail or whether a bolt is an equivalent. Is a spot weldment an equivalent? Is soldering an equivalent of welding, and so on. The question of how far afield a searcher will go before saying that something is no longer an equivalent determines the scope, extent and/or time of search, assuming that finances are not entered into the picture.

One also is troubled by the fact that what may be an equivalent in one field of endeavor may not be recognized as equivalent in another field of endeavor. At what time did a transition occur? In the United States if a man claims a particular structure, and you find the exact copy of that structure in every sense of the word, (i.e. it is congruent, and you can superimpose one on the other and they are identical) it does not matter what it is used for. If that is what he is claiming, you have completed your search. But if he has any difference at all, when will you worry about the difference? And here we enter into another area which creates a problem to the searcher in the United States patent system, and that is: to receive a patent "invention" must also be present. Invention as far as I am concerned, and it is purely a personal approach, reflects a state of mind. It represents a difference which one knowing the problems in a particular area, recognizes as being sufficiently different to be worth a 17-year exclusive grant by the United States Government. People may differ with me as to what invention is. I find this the handiest way of defining it. A man technically qualified and sufficiently versed in the legal lore that has grown up around the term "invention" will look at the difference and say this difference is great enough to be worth 17 years of exclusive grant. But, you see, this determines how far one is going to search. Are you going to look at a difference and say, "Well, yes, it is different, but it is not enough different to be worth a 17-year patent. End of search!" Or are you going to say, "I do not know whether it is worth a 17-year patent; I am going to search until I find it." Every searcher must face the problem of how short he is going to make his search or how long.

A searcher is also faced, particularly in the chemical area, with the question of variations. One may claim "means for sitting"—e.g. a chair or stool. He may then claim variations on that theme, and assign a particular configuration to the chair with a very broad claim reading on that configuration, and further variations in detail of that configuration. Now, as a searcher, is one satisfied in finding just the broad description of the chair, or must one go into the various species, the various variations in the chair?

It works both ways. One may find a particular variant as set forth in an application and have to decide whether this closes the search or whether one must then continue in order to find all the variants, as well as possibly a teaching of the generic or general terminology to describe that entire family or that entire class of chairs. In many instances the classification systems is such that non-semantic variants are all in the same pile, the same sub-class, the same class. They may be so distributed in the chair art, but in most instances as soon as the claims vary one from the other the search varies to pretty much the same extent. Unless one is to start with Patent No. 1 and search through Patent No. 3,000,-000, the searcher must determine by using the classification tools as best he can, where he will have the optimum search experience.

Somewhat the same search problem, and one to which I am much closer because it relates to the mechanical field, is posed by claims that are couched in combination and sub-combination relationships. In searching for an automobile, this is fairly straightforward. There is a class of vehicles. But if one claims, in addition to the automobile and its various component parts, details of any particular part of the automobile, there is literally no limit as to how far afield the search can go. A transmission is not in the same class with an automobile. Gears that make up the transmission may be in an entirely different part of the class. And if one goes into further detail in terms of how the gear is made or what the gear is made of, one is still further afield from the original class of automobiles.

What I am trying to indicate here is merely the fact that a claim, being our initial starting point, determines how far afield one must search to meet the claim, and in meeting it, you have to meet it in terms of whether it is new, or not new, because if it is new, that is the end of your search. If it is not new, is it sufficiently different so that you think it is worthy of a 17-year grant? And again, if it is new, is there something old that is an equivalent? If the old teaching is such that reasonable people in related fields of technology will recognize and admit that one is an equivalent for the other, even though it is new, again a searcher can stop searching. But I want to caution you that in the present state of our classification, almost every time you talk in terms of searching for a variant or a difference, a graduation in the claim language, you are generally off at another tangent in the 3 million patents that make up our American patent system, as well as the 9 million foreign patents we now have.

The only thing I would like to add is truly taking advantage of having you here before me. I am hoping that in the discussions today, as well as tomorrow, there will be a reasonable amount of emphasis on the problems of today relative to the manual classification system, as well as looking forward to mechanisms or machines for aiding searching tomorrow. Thank you.

Chairman Fay: Thank you very much, Mr. Rotkin. Are there any questions? If there are not, I am going to ask another of our examiners, who works in the electronics area, Don Stein, to tell about some of the problems he has encountered in his work in our Office of Research and Development. Mr. Stein.

Mr. Stein: Thank you. I will try to tell you a little bit about what the Office of Research and Development in the United States Patent Office is doing to help solve some of the problems in storing and retrieving electronic patents.

We have many sub-projects within the electronics project, reflecting a balance of shorter and longer range objectives. Let me describe first our major activity over the past year which is of a shorter range nature. We have selected a group of patents which include miscellaneous transistor circuits. We have attempted to devise an indexing scheme that would lend itself to mechanization for this group of patents. We drew up a list—a schedule, a classification list—of approximately 1,000 terms to cover the information in these patents. We are talking now about approximately 1,500 United States patents, and approximately an equal number of foreign patents that are classified in this particular area.

Each patent is analyzed by human beings and is analyzed three different times: two analyses de novo and one reconciliation which will bring together the two analyses and is actually a third analysis which reconciles the first two. Each analysis takes an average of approximately two hours to complete, so that the total analysis time for each patent is six man hours. Each patent is assigned approximately 100 to 125 index terms which reflect in great detail the information contained in the patent.

At present we have completed analysis of approximately 700 original United States patents which are in operation and actual use by examiners in searching. The searches are performed manually by using Batten or peek-a-boo cards. There is a great deal

of flexibility and redundancy in the system, so that the patents may be retrieved from many different points of view. There is a burden upon the searcher to vary his search request as he is searching. As he sees what kind of answers he is getting, he is expected to broaden or narrow his search, or perhaps change the point of view of his search, so that his search will be complete. This briefly describes this aspect of the electronics work.

Now, using this file as a basis, we are beginning to perform research in two areas that will attempt to mechanize the analysis phase, which is the burdensome phase, as you probably recognize. We are first going to study the natural language text of these patents and the possibility of retrieving information directly from the natural language text. And secondly, we are studying the possibility of encoding and retrieving the electronics circuitry which appears in these patents.

For the experiment with the natural language text, we are selecting 100 of these transistor circuit patents. From the natural language text of these patents, we will produce a magnetic tape which will have full text of each of these hundred patents. This magnetic tape will then go on a computer and we will attempt to determine what techniques are necessary to retrieve the same concepts, using a computer and the natural language text, as are encoded by manual means at present. In other words, we will select certain concepts which are coded manually, such as "feedback" or "gating" and we will attempt to retrieve them from the natural language text. We will attempt to draw up rules for retrieving them from this text. We wish to determine how feasible this approach is for electronic patents.

With regard to the circuit itself, I would like to note two things: First of all, we have performed some preliminary experiments which seem to indicate that a great deal of the circuit information is contained in the text itself. We had a student summer employee who was given approximately ten patents without the circuit drawings, and he was asked to read the text and reconstruct as much of the drawings as possible. In approximately seven of these ten cases, he was able to reproduce the entire drawing, except for one or two connections. In the other three cases he was able to reproduce all the connections which were essential to the inventive concept, leaving out certain environmental connections, which were not completely described in the text. This would seem to indicate, at least preliminarily, that it may not be necessary to fully encode the circuit itself, but it may be possible to work with the textual or natural language material in the patent.

Secondly, with regard to the circuits, we have initially explored three different methods of representing the entire circuit by automatic means. The first is a linear notation method. The second is a matrix notation method. And the third is a lattice method—a mathematical lattice type of representation. We are at present attempting to carry these three schemes to a point where we can test them to see to what extent it is possible to retrieve portions of drawings automatically, using machines.

Perhaps at this point I should ask if there are any questions as to any of the specific details of our work.

Mr. Cole: Do you look at the claims at all when you analyze this material, to get any help from the claims as to what the novel matter is which will be classified, or do you just go ahead and classify the whole business?

Mr. Stein: I presume that you are talking about the manual analysis. Inasmuch as the United States Patent Office grants a patent on novelty, and a patent application may be rejected not only on what is previously claimed, but also on what is previously disclosed, it is necessary to read and analyze the entire patent text, not only the claims. We do pay particular attention to the claims in the manual analysis, and insure ourselves that everything which is in the claims is properly encoded on our system. But we also, in great detail, read the entire specification and look at the drawings when making this manual analysis.

Mr. Lawlor: Have you tried giving some examiners the drawings and asking them to reproduce the specifications?

Mr. Stein: No, that we have not tried.

Mr. Jancin: I'd like to ask a question directed to Mr. Rotkin as well as yourself. As I see it, there may be two problem areas here. One might be looked upon as the long range objective, when mechanized searching will be a very neat kind of thing with little neon lights blinking and cards hopefully passing here and there, and then we have a more immediate problem—the problem that exists today. I would like to toss out this general question to the Patent Office R & D, which I think is prob-

ably more knowledgeable in this area than any other group. Have we taken a look, or have we made any attempt to look at the existing hardware, with the possible assistance of programmers in order to come up with a short range—I won't call it solution—but short range assistance, to help ourselves today with something that is not as sophisticated as we might like, and then working on the side in a more truly research effort, toward a more sophisticated goal some years ahead? Could anyone answer that please?

Mr. Rotkin: This is purely a personal answer. I can not pretend to speak for anyone else. Working within the confines of the budget and personnel, the effort that has been made has been very limited. There is no denying the fact that the simple punched card or the simple McBee sort system, could be useful to a limited extent in many areas. Some examiners in the Patent Office have seized upon these to help them, once they have gained some experience in their particular art. I personally feel that this could go further in many areas. This would simply be a manual card collection and manual pin-sticking. In some areas, there is no reason why it could not go beyond that, particularly as the chemists have discovered in their area. This is without any theoretical advance over what we know today either as to technique or equipment. But as I have said, because of a limitation of money and manpower, and the press of other work, the effort now has been to continue with our present system, and work on what I call the "pie in the sky" approach of mechanization tomorrow. I am hoping that our Office will devote more attention to the immediate problem, but this requires both manpower and money.

Mr. Pfeffer: I would like to answer Mr. Jancin from the point of view of the Research and Development group. We have adopted the viewpoint of looking both at the long range and the short range problems, with a view to trying to solve some of the more immediate problems with respect to helping the examiners right now. In addition to trying to solve some of the more difficult long range problems, we have taken a good hard look at available hardware through the assistance of many business organizations—your own, the International Business Machines Corporation has been very helpful in the past—and also through the National Bureau of Standards, Data Processing Division.

The problem today is not a problem of hardware. It is an intellectual problem. We have to learn how to organize the material before we can make use even of existing hardware. And the hardware and the programmers by themselves will give us no help whatsoever until we have learned how to solve the intellectual end of the thing.

Mr. Stein: I would like to add that I think very little is gained by mechanizing at present, or by utilizing the present state of the art of mechanization. This would be essentially mechanizing something similar to the existing classification system, or mechanizing a file such as we have done in transistors. Let me add, the main thing we have gained in our transistor file is in the accuracy of search and in depth of analysis. We have essentially encoded several things which are not obvious by looking at the patent in a cursory fashion, but are buried deep within the patent. But I think on the whole very little is to be gained by this.

I have just returned from a conference sponsored by the Association for Computing Machinery on Techniques of Programming Digital Computers for Information Retrieval. I think that conference pointed out very clearly, that the main problem areas today do not lie in devising specific programs for computers, do not lie in the hardware area, do not lie in applying the present state of the art to patient office searching problems. Rather, the essence of the problem—I think this was the consensus of the people at this conference—is the intellectual one. What is information? How should information be organized? In what fashion can the thoughts of the person who wrote the words be made available to those people who are searching? I think it is most important to solve this problem, and that mechanization along the way will probably not gain too much speed, and perhaps will gain some accuracy. But I doubt whether it is worthwhile on a large scale.

Mr. Bulder: My question concerns three methods of analyzing drawings, first the linear and second the matrix. What do you mean by that? What is a linear analysis? What is a matrix analysis, etc.?

Mr. Stein: I can at present explain this only briefly. Let me, before I begin to do this, extend an invitation to any of you to visit our Office of Research and Development. We will be very happy to go into as much detail as you might desire concerning our present work in any of the projects.

Very briefly, a linear notation attempts to set down a set of symbols in a linear fashion which will represent the circuit. The matrix approach attempts to set up a matrix of symbols which will represent the circuit. And the lattice approach attempts to set up an information lattice with various information points, which would represent the circuit. I feel I can not go into more detail than that here.

The main problem here is that you have essentially a three-dimensional array in an electronic circuit, and within the present state of the computer technology, it is impractical to search every part of every circuit in the file that is stored, in order to find an answer for a question. One must devise some shorthand technique of representing the circuits.

Mr. Wessell: Did I understand you correctly to say that you used 125 terms for each patent?

Mr. Stein: That is the average, yes.

Mr. Wessell: Are these terms which appear in the patent or do you apply some of these terms from a pre-formed dictionary?

Mr. Stein: This dictionary was drawn up after a careful study of selected patents from this file. And the dictionary is constantly being added to and modified as further patents are analyzed.

Mr. Wessell: And do you find this a very deep type of index?

Mr. Stein: We feel that it requires individuals very well trained in electronics, and also trained in the United States standards of patentability, in order to perform these analyses. We cannot use clerical people, and we cannot even use electrical engineers unless they have some training in the United States standards of patentability.

Mr. Wessell: In searching then, you would have to describe your question in very great detail, would you not?

Mr. Stein: No. The terms are of varying scope. Some terms are very broad. Other terms are quite specific. So it is possible for the searcher by selecting not more than perhaps ten to fifteen terms, and modifying these as he is making a search, to narrow his search down to a practical limit.

Mr. Michel: While manually extracting the data or the material disclosed in the specification, does the operator take account in every patent which he transfers to a card, of the material which is obviously old, which he knows has been encoded before in connection with some other patent?

Mr. Stein: Yes. He encodes all the information because, although the individual material, or a specific part of the material, may be old, that material in combination with some other features of the invention may be new. So that we encode everything that we can find there.

Mr. Pfeffer: May I answer a little bit further? Commissioner Michel, in addition to the statement which Mr. Stein gave you, it is very difficult for any individual to determine all by himself what is old and what is new. And until we can find some way of correlating information and making a pass through it to make determinations of this type, it is safest at this point to encode everything that is present. We have had many experiences where the examiner thinks that something is old. It looks old. He may have seen it somewhere and it may have been in a pending application rather than a published article. Secondly, there is always the possibility of losing information which may appear somewhere in some obscure journal or publication and nowhere else. So it would be helpful to have that information made available again, especially where the publication date may be critical.

Mr. Michel: Even though that might produce a whole lot of duplication in your cards?

Mr. Pfeffer: Yes.

Chairman Fay: If there are no further questions, we will recess until after lunch. The afternoon session will begin at 1:30. Thank you Mr. Stein.

I want to make a couple of announcements. I have been asked to advise you that at luncheon today there will be no head table and no speakers. Our visitors should feel free to take any of our men who are willing to talk and ask them any questions you feel you want to. And I will ask our examiners to disperse themselves among our visitors so that we can get the full benefit of this interchange.

The opening session was adjourned.

Second Session

Monday Afternoon, October 23, 1961

The second session was called to order at 2 o'clock by Mr. John Green, Director, Office of Technical Services, Business and Defense Services Administration, U.S. Department of Commerce, acting as Moderator

Mr. Green: I am with the Department of Commerce and I have been asked to moderate this afternoon's session. As you know, this is the first technical meeting of this group and we are endeavoring to identify areas of cooperation in which the various patent office representatives might work together to advance the cause of storage and retrieval on patent information. Of course, in today's session we are speaking only on patent classification, and we have three authorities who are going to make direct presentations. As you can see from your programs, they are the Honorable Werner Rubach, Director of the Technical Section of the German Patent Office; Mr. H. S. Vincent of our own Patent Office—The United States; and the Honorable L. F. W. Knight, Superintending Examiner in the United Kingdom Patent Office.

Our plan this afternoon is to have these presentations without a break for question and answer. Then we will have a roundtable discussion, which will last, I imagine, until about five this afternoon, at which time we will conclude. We hope to have a short intermission for coffee around four, and there will be proceedings of this meeting printed for those of you who want to keep abreast. Everything is being recorded.

With that short background, let me proceed to our first speaker, who is Mr. Werner Rubach. He is Director of the Technical Section in the German Patent Office. As such, he has responsibility for examination, classification, documentation and the assignment of applications. His educational experience includes a mechanical engineering degree from the Technical University of Berlin, and he will speak to us this afternoon on the International Patent Classification System. Mr. Rubach.

Mr. Rubach: Ladies and Gentlemen, I will speak to you about the international classification of patents for inventions. Systems of classifications are tools to help us find our way through an overwhelming variety of subject matter. If, as in the fields covered by the Patent Offices, new varieties of subject matter are coming up incessantly, constant effort will be spent in order to keep our tools keen and efficient.

In Europe such an effort is being carried out in parallel at present under the European Convention on the International Classification of Patents for Invention, the Preamble of which reads: "The Governments signatory hereto being members of the Council of Europe, considering that the aim of the Council of Europe is to achieve a greater unity between its members, for the purpose of facilitating their economic and social progress by agreements and common action, and having regard to the resolution of the Committee of Ministers of the Council of Europe of 12th September 1952 recognizing the necessity of the generalization of the practice of examination of patent applications for novelty, and considering that the adoption of a uniform system of classification of patents for invention is in the common interest and likely to contribute to the harmonization of national legislation have agreed that each contracting party should adopt the system of classification of patents for invention set out in the Annex to this Convention." The abovementioned uniform system is being used at present by the Patent Offices throughout Europe inasmuch as their Governments are members of the Council of Europe. Both Belgium and France apply it as their exclusive means of classification, whereas all other countries concerned use it as secondary classification aside from their national ones.

The outline of the uniform system will be found in the Annex to the Convention where eight main classification sections are listed, namely, (a) human

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necessities, (b) performing operations, (c) chemistry and metallurgy, (d) textiles and paper, (e) fixed constructions, (f) mechanics, lighting and heating, (g) physics, (h) electricity. For further subdivision of the fields covered by these sections, about 103 classes are provided, of which 52 classes have already been elaborated by a Working Party of Experts on classification. Let us stress here that the sub-classes of the I.P.C. embrace a far broader field of technology than sub-classes in the U.S. classification system. To cite an example, while the international class F–05 deals with all pumps, the various known types of pumps are grouped in sub-classes of that international class, each sub-class again being split into many groups and sub-groups.

The Working Party of Experts on Classification

Under Article Two of the Convention the responsibility for further elaborating the 103 classes of the Annex, is assigned to the Committee of Experts on Patents of the Council of Europe. Other responsibilities of that Committee include the development of proposals for the unification of the patent laws and procedures for granting patents in the various member countries of the Council of Europe. For work on the International Patent Classification, the Committee of Experts on Patents have legalized the Working Party of Experts on Classification whose activities began back in 1952. This Working Party includes experts of France, The Netherlands, the United Kingdom, and from the Federal Republic of Germany, the Chair being held by the representative of a country not concerned with the elaboration of the scheme at present. A member of the Swedish Patent Office acts as Chairman. When in 1952 the Working Party began their discussions at Strasbourg, they at first tried to create an entirely new system for subdividing the whole field of technology. A draft listing 115 classes was set up and disseminated to the member countries of the Council of Europe, for consideration. However, no country, or no patent office respectively, could agree with the system proposed. On that, it was decided that a new international classification system should rather be shaped in close correlation with one of the existing systems of patent classification, in other words, with a system already in general use all over Europe. This condition was met best by the German System of classification, then in use without any alteration in the Scandinavian countries, with some alteration in the Netherlands, Austria and even in Russia, Poland, Czechoslovakia and Hungary. Even now it is used in Switzerland. It was, therefore, eventually chosen the system underlying the scheme of the new international classification.

When the activities of the Working Party started, after the previously mentioned difficulty, the broad subdivision cited above was worked out for good in order to cover the whole field of technology. It is used today throughout Europe, so that you will find a corresponding symbol on every European specification issued by a member nation of the Council of Europe.

Principles Guiding the Working Party

Classification for invention may be conceived under several aspects, namely, subdividing the subject matter according to construction, function or purpose on the one hand, or to an industrial branch or art on the other hand. I do not know of any workable system in any Patent Office which would be built up solely on either of the two. They rather incorporate both aspects at the same time. It is true, however, that some countries seem to prefer the construction, function or purpose, while others favor systems reflecting subdivision of industry in branches, or of technological arts.

The difference is well illustrated by a comparison of the classification systems presently used in the United States and the German Patent Offices. Construction, function or purpose prevail by far as characteristics of the main units of subdivision on the American side, i.e. the classes include subject matter related by technological functions, whereas the German practice subdivides according to art. There are, however, some classes also in the German system where the subject matter is kept together according to fundamentals either of construction, function or purpose. If the German main classification unit is set up that way, it is called a general class. There was no doubt that a certain percentage of the German classification system could not be taken over into the new European scheme without checking, amending, and reshaping according to the latest developments of the arts. Taking into account such modern trends as standardization and automatization, it was felt to be necessary to have more general classes in the new European scheme than formerly provided for in the German system for patent classification.

As a consequence, classes devoted to a special art, which I might call special classes, are now being restricted to subject matter really and truly designed

for a special art, or adapted to a special use. All such elements or construction units, however, which perform a distinct technological function in a machine, in an apparatus, or in a device and which are not adapted in their constructional features and do not differ from the common constructional features of such elements, should be brought to a general class. In cases of doubt, the subject matter will be classified under the relevant general class, or in other words, the general classes take precedence over the special classes.

Procedure

If another one of the classes listed in the Annex is scheduled to be subdivided, work thereon begins with a first proposal to be submitted to the Working Party by one of the countries practicing novelty searches when examining patent applications. The first proposal which, of course, takes note of any current development of the art concerned, will be disseminated to the members of the Working Party. They study it and are free to suggest alterations or amendments and to make other remarks to the author of the first proposal. All suggestions are now scrutinized by the author and amendments and changes felt to be useful are incorporated into a revised draft which, again, is sent to the members of the Working Party. In due time, the revised draft will then form the basis of discussions in the forthcoming meeting of the Working Party. Such meetings are held twice a year, Spring and Autumn, with a view to finalizing and legalizing the revised draft.

Progress

As there are various principles applicable to classification schemes, as in practice systems existing in Europe show a lot of differences, and as furthermore, opinion might differ as to how to classify patents on inventions granted under different laws and procedures, one can imagine the extreme difficulty faced by the members of the Working Party in their current work. Under these circumstances, the subdivision of classes has not yet been terminated. Moreover, I do not hesitate to admit that progress in the sessions of the Working Party is now slower than it was in the beginning.

At that time we could go ahead without much regard for subject matter dealt with in already elaborated classes. At the present period, however, when more than half of the subdividing work has been completed, much care must be taken to avoid overlapping of groups and subgroups, as the finer subdivisions are called, with groups and subgroups in other classes. It means more and more time spent on exact wording and reliable cross referencing. Much discussion has been devoted to ways and means of accelerating the work. But so far no sensible solution of the problem has been found.

Rules Governing Classification of Products or Processes, Special Purpose Machinery and Special Purpose Methods

In dealing with the problem of where to classify products or processes for which no classification unit can be spotted that would be immediately appropriate, the following interpretation of the International Patent Classification scheme has been agreed upon by the Working Party. To read the agreement, "In interpreting this system of classification, it should be noted that the wording describing the subject matter of a classification unit normally designates either a product or a process, or both, the words "product" and "process" being used here in their widest possible sense, as indicated by the examples given below. Wording in other terms, e.g. designating a use or application of a process or material, is used in some cases.

"Examples of products are: chemical compounds, compositions, wire films, fabrics, articles, apparatus, tools, machines, transport means, structures, assemblies, electric circuits and systems composed of these. Examples of processes are: polymerization, fermentation, separation, shaping, conveying, treatment of textiles, transfer and transformation of energy, building, preparation of foodstuffs, testing, methods and modes of operation of machines, and processing and transmitting information. In many cases, the subject matter of a classification unit is not confined to the product or process designated, but should be understood as follows: (1) A classification unit designating a product includes the process used in the manufacture of the product unless these processes are covered elsewhere in the system by a classification unit or units designating a process. Insofar as the unit thus includes a process, paragraph two (which follows) also applies to it. A classification unit designating a product also includes any parts of the product not covered by other such units. (2) A classification unit designating a process includes any apparatus tools, machines, devices or materials used in the process, unless the apparatus, tools, machines, devices or materials are covered in the system by units designating products; and also includes any

product produced by the process, unless it is covered in the system by a unit designating a product". This interpretation has proven to be quite efficient whenever new products or processes have been involved.

But how do we handle the cases where machinery or processes are adapted to special purposes? It is our practice to classify the use for a special purpose of a machine, an apparatus or a device under the class or sub-class provided for this purpose. In the case of substances or materials, however, a tricky problem remains to be settled by our final decision. Where do we want to put an invention dealing with the method for making a substance in such a way that a substance with definite special physical properties results? Such cases could, indeed, be asisgned either to the general class provided for such substances, or else to the class grouping all objects for the function of which such properties are used, only just these properties guaranteeing that the desired function really occurs.

On this question it has proven to be extremely difficult to come to an agreement. Personally, I am inclined to favor a solution that would gather and keep together under one heading all methods for making substances or materials, even the particular methods that include steps for obtaining products with definite, special physical properties.

Application of the International Patent Classification

The Annex to the European Convention, where the basic systems of classes and subclasses is set forth, in its preliminary note explains both underlying principles and application as follows: "This classification scheme is devised only for the purpose of classifying inventions which are the subjects of patents, and the requirements of Article 3(1) and 3(3) according to which the printed patent specifications issued by the Contracting Parties have to be marked by the national authorities with the complete symbols of the International Classification, are intended to be applied only to such symbols of classification as are necessary to classify the invention of any particular patent. These symbols will usually relate only to one subclass and one place in the elaborations thereof, but in certain cases they may extend to two or more subclasses and/or places.

There is, however, no bar to the use of additional symbols of the classification for any other purposes (for example, for classifying subject matter which may be disclosed in a patent specification without forming part of the invention thereof), provided that, if such additional symbols are placed on the documents referred to in Article 3(1), these symbols are distinguished from those which relate to the invention as stated in the paragraph above, for example, by being printed in lighter type. It is not necessary for the additional symbols to include any symbols relating to groups or subgroups of the classification system (which are not yet included in the Annex to the Convention), and they may, if desired in any case, indicate only the class concerned."

There might be argument as to what purpose a patent classification system is meant to serve. Even in the Working Party, lengthy discussions have dealt with the problem whether the International Patent Classification is a tool designed exclusively for patent office practice, or whether it is meant to be equally important for industrial and other circles and enterprises interested in publications in the patent field. As a matter of fact, the latter users do not only wish for an instrument with which to carry through novelty searches, but they want to have available also a tool for finding out where the road is free for their own research and development, and which roads, on the other hand, are closed by valid patents belonging to others.

What does the Convention title say to that? It reads: "European Convention on the International Classification of Patents for Invention". So the problem boils down to our deciding what a patent really is. Is it a sheet of paper only, technological literature to be called "specification", or is it something more than that, namely, a monopoly granted on an invention found to be novel?

If the latter alternative given is held to be correct, every scheme for the classification of patents represents a tool for the orderly grouping of rights protecting inventions officially screened for novelty. This is what we want to keep in mind when reading the aforesaid paragraph (1) of the preliminary note.

When classifying inventions along the lines set forth in paragraph (1) of the preliminary note cited above, the International Patent Classification lends itself easily to use for multiple classification. For this application several symbols will appear in print on the specifications instead of only one, namely, as many as there are classes or subclasses respectively, relevant to, or covered by, the invention concerned. Also, whenever subject matter characterized by a subsequent claim relates to another class or subclass,

this multiple classification of the invention will be used.

In German Patent Office practice, however, every application is meant to be handled under the exclusive responsibility of one examiner only. This is the same person who eventually will be entitled to sign the papers granting a patent. Under this procedure, one symbol on a specification stands for this one and only person responsible in that case, and a subsequent claim for which another symbol would be appropriate will be taken out of the application and examined in a separate application under its appropriate symbol.

Aside from the symbols relating to the invention proper, specifications may be indexed by using still other additional symbols. Such symbols would relate to technical features mentioned in the description of the invention, but not forming part of the latter. By this practice, the International Patent Classification is, in fact, used directly for purposes of documentation. And, indeed, any searching of specifications which bear such additional indexes, might be carried through faster than before because the searcher, by simply scanning all classification symbols printed on the head of the first page, already gathers conclusive information about the scope of technical subject matter to be found in that description.

For the time being, experiences in the fields where the International Patent Classification has been elaborated are rather encouraging, so that it seems reasonable to expect eventual success of our work conducted under the motto: "E pluribus unum." Thank you.

Mr. Green: Thank you, Mr. Rubach. As I said earlier, in order to move the program ahead and to preserve adequate time for the roundtable discustion, I hope you will all save your questions for Mr. Rubach and his colleagues until later.

Our next speaker, Mr. Herbert S. Vincent, who is a patent classifier in the United States Patent Office, took his degree in Physical Sciences from Ohio State. He has been in the Patent Office since 1942 and has specialized in the classification of patents since 1946. He has undertaken the reclassification of several of the classes in such diverse fields as coating apparatus, laminated fabrics, and electrical connectors. This afternoon he will describe to us the classification system employed by the United States Patent Office. Mr. Vincent.

Mr. Vincent: It has been estimated that about half the time spent in the examination of patent applications in the U.S. Patent Office is spent in the search for references, the prior anticipating publications. As the sciences grow more complex and our fields of knowledge expand, the search problems increase, of course. In our patent system alone we start today with a mass of three million original patents, and three million two hundred and fifty thousand cross references. Toss 48,000 newly issued patents into the pot every year. For each newly issued patent add an average of two cross reference copies. To this add the vast numbers of foreign patents, technical literature, publications, and miscellaneous unofficial references, and we find that we have a rapidly growing child, one that might one day be big enough and mean enough to lick the old man if he is not kept well in hand and carefully brought up.

Today in our patent classification system we have three hundred and eight main classes of invention, broken down into 59,300 subclasses. The new patents which issue every week, are placed in the system by the examiners who issue them. They are placed in accordance with class and subclass definitions, and by following definite rules of procedure. The classes are developed by our Classification Division, whose primary function is the creation of these new classifications.

The purpose of a classification must, of course, be the guide in its derivation. A patent classification must primarily divide the subject matter into easily searchable groups for patent examining purposes, must reduce the danger of issuing interfering applications for patents, and must provide fields of search for industry to (1) avoid infringement of patents and (2) provide for state-of-the-art searches.

What is the best basis for bringing together into major divisions, or major classes, those things that are the nearest alike for our purposes? It has been determined that utility, or use, must be the foundation on which to build our major groupings. But the utility must be the immediate utility, not an ulterior, remote, or accidental one. The term "proximate function", is frequently used by us to describe this particular characteristic. A pipe with fins on the periphery might be used as a condenser for alcoholic vapors, or it might be used as a radiator to heat a room. These two different uses for the structure are accidental functions. The direct, or proximate function, of such a finned tube is heat exchange. A proper and worthwhile classification for our purposes should be based on this, rather than on the accidental functions. Thus, if we have two

patents, one of which discloses the structure for use as a radiator, and the other discloses its use as a condenser, the patents would probably be classified together on the basis that they both have the same proximate function, even though they have different ultimate uses.

So we believe that our patents are, in the main, better classified in accordance with the function or effect they must perform or accomplish, rather than in accordance with an object toward which the act is directed or in accordance with the result which is intended to be achieved. Of course, a word of caution must be given here. A hammer, a golf club and a drumstick all have the function of striking a blow. But obviously, they should not be classified together. So the test of special use might have to be applied to the selected functional basis. Of course, the prime function of the classifier is to make the proper determinations as to the depth he will analyze to determine the similarities in the proximate function of the patents that he is classifying.

Our classification then, at least in its larger groupings, is not based on structure alone. For minor subdivisions the classifier might well use a structural basis of distinction. Having collected all heat exchangers into one class, the classifier might then subdivide them on the different structures that are recited.

Our time today is limited so we can not go too deeply into the theoretical basis for our classification. Obviously, other factors must be considered. In the manufacturing arts, for example, a plural step process must be considered from the point of view of producing a special effect or product. A composition of matter or stock material should be classified in accordance with its composition where possible, although the test of special use might have to be applied here, too.

Every patent has subject matter that is recited in the claims and subject matter that is disclosed but not claimed. It has been deemed advisable to classify on the basis of the claimed subject matter. The claims set forth that which is novel and distinguishes a particular patent from all other patents. Thus, in basing the classification on that portion of the disclosure which is claimed, we may best be assured that the significant subject matter is being considered. Of course, the unclaimed disclosure may be as valuable as the claimed disclosure for search purposes. Therefore, the classification should provide for both. A patent is placed as an original copy on the basis of the claims and a search for unclaimed disclosure is provided by way of cross reference copies.

Each of the 308 main classes are carefully and meticulously defined and limited in scope as to subject matter. Further, each class is carefully annoted with descriptions of related fields of search. The classes are divided into subclasses each with its definations and notes. The number of subclasses within a class varies greatly, being dependent on the nature of the subject matter activity in the specific field, age of the class and other factors.

Among the 308 main classes, two guide lines are used to determine placement of a patent into the system. The first guide is a general superiority rule, and the second is the specific class definition. The general rule of superiority among main classes is as follows:

Superiority of Types of Invention

(Claimed)

1. Process_____ (of using a product)
2. Product _____ (of manufacturing process)
3. Process_____ (of making a product)
4. Apparatus ____ (to perform (3) and/or to make (2); e.g. machine, tool)
5. Material_____ (used in (3) to make (2); e.g. composition, stock, blank or intermediate)

The above listed items are arranged in order of superiority, each item being dominant over those following in the list. The list then is a hierarchial determination for the placement of the original patent.

This general rule of superiority, as set forth in this list, is followed unless the specific class definitions detail exceptions to the broad principles. If so, the specific exceptions control classification.

So much for the distinctions among main classes. Let us look now at a typical class and examine its structure. I will now directly contradict myself and say there is no such thing as a typical class. On consideration I find that I have to agree with myself that this is so! However, it has been found over the years that in many new classifications a pattern may be discerned, and this general arrangement (subject to special exceptions which may be tailored to any particular art) is usually followed in most of our new classifications. In Figure 1, the letter "A" represents the basic subject matter of the class. By basic subject matter we mean the heart wood of

the class, the tie that runs through all the disclosures in a particular class, the thing that relates all the patents in the group. In Class 100, Presses, the basic subject matter is the particular means for applying pressure to the workpiece. In Class 339, Electric Connectors, it is the particular electrically conducting joint that forms the basic subject matter. In class 118, Coating Apparatus, it is the means transferring the fluent layer of material onto the base.

TYPICAL ARRANGEMENT OF A CLASS

(Basic Subject Matter of Class is Represented By the letter "A")

I Special Types of A

II A combined with specified non-A features or devices (A&B)

III A with perfecting features (A&P)

IV Convertible (A to or from B)

V Combined (A&X)

(no combined A below this line)

VI Plural A (A^1 with A^2)

VII Types of A (A^1—A^n)

VIII Subcombinations of A specialized to use with A

IX Subcombinations of A not specialized

X Miscellaneous

Figure 1

The titles I through X set forth in broad terms the types of subclasses and also the general order or scheme of superiority in a typical class. In this arrangement, special or unique variants of the basic subject matter appear in the plan as I. These are considered to have some special quality of importance which requires a high order of priority and entitles them to appear in a high position in the schedule.

Following will be II, subclasses relating to combined features. These are devices of the class combined with something that is not of the class, something in addition to the basic subject matter of the class. III represents the basic subject with perfecting features, that is, something improving the operation of the basic device or embellishing its basic function. The distinction between II and III grows thin at times and in fact it is not too important that a specific difference be drawn between them. It is well, however, for the classifier to recognize that the two types exist.

Many classes provide a subclass labelled "convertible" as shown at IV. These are particularly adapted to be altered to a different type of device. An example of this is the kitchen stool that may be converted to a ladder.

A miscellaneous subclass titled "combined" is shown at V. This is the residual subclass for "combined" features not provided for above this position in the schedule. It should not be necessary to search below this point in the schedule for combined features.

Below this position, we deal with variants of the basic subject matter of the class. VI sets forth organizations involving multiples of the basic subject matter, followed by VII, the variant species of the basic class subject matter. Generally the bulk of the subclasses in a class are variants of VII. Under VIII and IX are found subcombinations or elements of the entire device and finally a subclass titled "miscellaneous" (X) which takes anything not provided for in any of the other subclasses in the class.

So, in examining the stylized class you can see that it has almost the structure of an inverted pyramid. The special things, the complicated things, the complex things, come first in our schedule. We gradually work our way down through the subject matter, winding up with the less important features, the sub-combinations, the things which might be not of specific use, but of general use.

Figure 2 analyzes class 100, Presses in terms of the abstract representations of Fig. 1. In the column labeled "subclass" are set out certain subclasses by number and title as they appear in the class. The right column gives the analysis of the subclasses in the generic terms of the Fig. 1 representation. We see that this class schedule is more than just a listing of items. Just as a road map is more than a list of places to go to. It is actually a physical plan with a special hierarchical arrangement. The schedule identifies relationships of concepts and things. It sets forth the whole in position superior to the part and the special effect before the general effect. By setting up comparative relationships, it allows the subject to be approached by comparison of similar and dissimilar things whether or not a specific name for the object to be sought is known.

Figure 3 is a portion of the Class 100 schedule. Note the first line subclasses—subclasses 1, 35, 43, 53, 54, etc. These are capitalized to facilitate scan-

CLASS AND SUBCLASS SCHEDULE ORGANIZATION TO LIMIT SEARCH

	Subclass	Explanation
1	Binding.....	Special type of press (A^1) as defined above.
35	Methods.....	Superior to apparatus.
43	Automatic or Material.	Any type press (A) (except special type binding taken out above) with perfecting features (Ap).
53	Interrelated or Safety Controls.	Ap.
54	Portable Receptacle Lid Applying.	Special type of press (A^2).
65	Compacting Ensilage Within Silo.	Special type of press (A^3).
70	With Additional Treatment of Material.	Any press A (except A^1, A^2, A^3 taken out above) combined with specified non-press feature.
99	With Alarm, Signal, Indicator or Test Means.	Ap.
100	With Ground Traversing Wheels or Guides.	Ap.
101	With Cloth About Cake Enfolder.	Ap.
102	Combined.....	Residual subclass for any combination not specified above.
103	Convertible.....	
104	With Drain Means for Expressed Liquid.	Type of press A^4 (expressing type).
137	Plural Diverse Presses.	Plural diverse A.
144	Concurrent Pressing and Conveying.	Type of press A^5 (screw press).
193	Plural Presses.....	Type of press A^6 (sequential A^6-A^6).
210	Roll and Platen.....	Type of press A^7.
211	With Flexible or Deformable Pressure Surface.	Type of press A^8.
213	Interfitting Cups.....	Type of press A^9.
214	Reciprocating Press Construction.	Type of press A^{10}.
295	Platens or Pressure Surfaces.	Subcombinations peculiar to presses.
298	Cloth From Cake Strippers.	Specified miscellaneous
299	Miscellaneous.....	

Figure 2

ning. They all have the same degree of indentation. They are what we call coordinate subclasses. Also, of course, subclasses 36 through 46 bear a coordinate relationship to each other, although they are all indented under subclass 35.

The claims or the claimed disclosure control the selection of one of the 308 major classes for the placement of the patent. Having found the class which by definition can provide for the subject matter, we can then proceed to place the patent in the class schedule. One copy, the original copy as we call it, being placed in the proper subclass. Cross reference copies can then be added. The classifier starts at the top of the class schedule and scans down the coordinate first line subclasses, rejecting each until the subclass as titled and defined includes the subject matter of the patent claim. Having found the first line subclass, he then proceeds to the coordinate subclasses indented thereunder, and once more scans down, rejecting coordinate concepts until the proper one for the claimed subject matter is once more found. The process is repeated until the ultimate coordinate subclass is found. Then the patent may be placed into a subclass indented thereunder on the basis of disclosure (in this last step only) if no indented subclass provides for the claim. The reasons for relying on disclosure in this ultimate step are twofold. First, anyone searching the genus must search all of the indented subclasses anyhow. So the patent will not be missed. And secondly, anyone searching the indented species only will find the original copy and thus, only one copy of the patent need be placed. We have thus saved cross reference copies which would overload our system.

Let us see how this works with a specific document to be classified. Fig. 4 represents a patent. This is a three-roll press. The material moves from left to right, passes between two hips as you can see, generated by the three roll. As it goes through, it is squeezed once and then it is squeezed a second time. Also disclosed in the document is the sensing means, which senses the thickness of the material coming out of the press and feeds back into the drive. By controlling the speed of the drive you can control the ultimate thickness of the material. Between the two lower rolls there is a turnplate for forwarding the material, helping it go through the press. The top roll, as you can see, is spring-biased downwardly toward the two other rolls and also has a variable axis as shown by the arcuate arrow, so that it can apply more or less pressure against either of the selected two rolls. So far as the claim is concerned, let us assume that what is recited in the left column is what is claimed, and what is recited in the right column is disclosed but not claimed.

Original Classification C. G. Smith
T. L. Stam, H. S. Vincent 1952
Definitions in Bulletin No. 407

1	BINDING
2	Methods
3	Compacting and binding
4	With automatic or material triggered control
5	With material winding or folding
6	With material severing
7	With material depositing or discharging
8	Binder applying
9	Preformed continuous annular binder
10	With precutting of binder to length
11	Plural flexible section binder
12	Through annular material
13	Helically along material
14	Indexing material between successive placements
15	By rotation of material
16	By swing of material gripping jaw
17	Binder supported across passageway for material
18	With material conveyer
19	With threader crossing material path
20	Delivering binder to end gripper
21	Concurrently delivering to joiner
22	Indexing gripper
23	Shifting gripper delivers binder to joiner
24	Threaders
25	Curved guide channel for pushed binder
26	Material receiving loop channel
27	Orbit travelling binder placer
28	Reversing for successive placements
29	Binder tighteners and joiners
30	Sleeve or clamp joining
31	Twisters
32	Binder tighteners
33	Joiners
34	Binder retaining material holders
35	METHODS
36	With pre-enclosing in textile
37	With separation from material of liquid expressed
38	With heating or cooling
39	With cutting or comminuting
40	With winding or folding
41	Forcing through constricted passage
42	Successive compressions from different directions
43	AUTOMATIC OR MATERIAL TRIGGERED CONTROL
44	Of insertion of separator between successive material charges
45	Of material addition, depositing or discharging
46	Of parallelism of platens
47	Of roll separation or speed
48	Of actuating means
49	Material presence or position starting
50	By pressure applied to material
51	With dwell time control
52	Reversing
53	INTERRELATED OR SAFETY CONTROLS
54	PORTABLE RECEPTACLE LID APPLYING
55	With receptacle transfer means
56	With lid fastening
57	With gathering of contents
58	With lid locating means
59	Receptacle mountable
60	Upwardly displaced receptacle

Figure 3

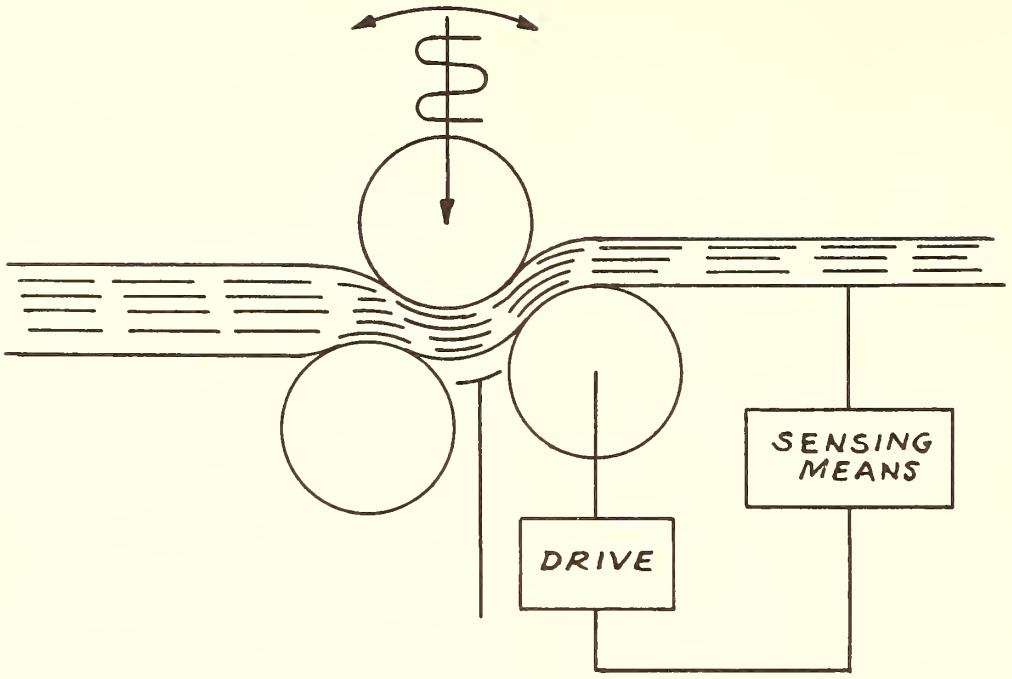
We will make the assumption that this document is properly classified in Class 100, Presses. We now must locate the proper subclass in the schedule for this particular document as an original patent and also the proper place to cross-reference any of the additional disclosures that we think worth classifying. Following the rules, we analyze the claim, in order to keep the subject matter firmly in mind. We then proceed down the schedule scanning the coordinate, first line, capitalized subclasses, rejecting each until the first capitalized subclass is reached that can provide for the claimed subject matter.

Subclass 144 (Fig. 5) is the first subclass to provide for the claimed subject matter. We now know that the patent must appear as an original either in this subclass or in one of its indented subclasses. We then proceed to the coordinate subclasses indented under subclass 144 and repeat the procedure. This process is repeated until the ultimate coordinate subclass is found, in this case subclass 163. The patent discloses but does not claim the adjustable line of force (subclass 164). Therefore the patent may be classified in subclass 164 as an original patent, since the disclosure may be relied upon for placement in an ultimate idented subclass.

We have another feature recited in the claims, and that is the turnplate. So a cross reference copy should be placed in the subclass that relates to turnplates, namely, 166. So far as the additional disclosure is concerned, it then becomes the duty of the classifier to make a subjective determination. This subject matter is disclosed. Is it valuable for reference purposes, or not? If, in his estimation, the subject matter disclosed but not claimed is valuable, he may place a cross reference in the places provided for. The automatic control feature would be cross-referenced into subclasses 43 and its indented subclasses.

In summing up the rules for placing the original copy of the patent, as among the 308 classes, claimed disclosure controls in accordance with a superiority schedule, the class definitions and the actual placement of prior patents. As between coordinate subclasses, the claims control classification of the original copy. As between a subclass and its indented subclasses, the original patent may be placed on disclosure. Insofar as cross reference copies are concerned, claimed subject matter must be cross referenced while disclosed subject matter may be optionally cross referenced at the discretion of the examiner.

PATENT



CLAIM

A press comprising a top roll and two base rolls arranged in pyramidal fashion,

the top roll being spring biased toward the two base rolls thus generating plural nips,

and a turn plate positioned between the two base rolls to guide material to be pressed from the first nip to the second nip.

ADDITIONAL DISCLOSURE

Automatic control of the drive means

Adjustable line of force

Figure 4

I hope that I have been able to give you some idea of our problems and the theories on which we try to base our classifications, and some of the rules controlling the administration of the system.

In drawing my remarks to a close, I would like to read a very brief sentence from the classic work *A System of Logic* by John Stewart Mill: "There is no property of objects which may not be taken as the foundation for a classification, and in our first attempts we are likely to select for that purpose properties which are simple, easily conceived, and perceptible at a first view. But these classifications, those involving simple and easily conceived things which are perceptible at a first view are seldom much adapted to the ends of that classification." From fifteen years of experience in the classification group, I believe that I can fairly safely say that our classification is rarely simple, it is never easily con-

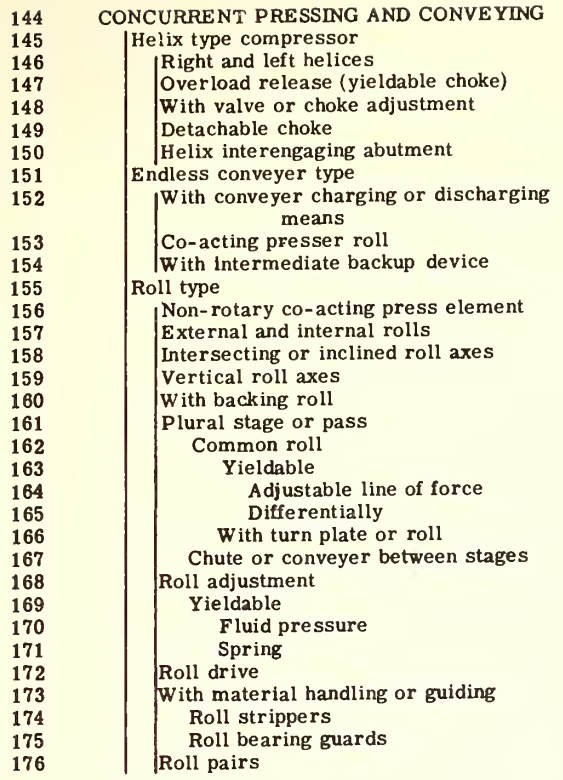

144 CONCURRENT PRESSING AND CONVEYING
145 Helix type compressor
146 Right and left helices
147 Overload release (yieldable choke)
148 With valve or choke adjustment
149 Detachable choke
150 Helix interengaging abutment
151 Endless conveyer type
152 With conveyer charging or discharging means
153 Co-acting presser roll
154 With intermediate backup device
155 Roll type
156 Non-rotary co-acting press element
157 External and internal rolls
158 Intersecting or inclined roll axes
159 Vertical roll axes
160 With backing roll
161 Plural stage or pass
162 Common roll
163 Yieldable
164 Adjustable line of force
165 Differentially
166 With turn plate or roll
167 Chute or conveyer between stages
168 Roll adjustment
169 Yieldable
170 Fluid pressure
171 Spring
172 Roll drive
173 With material handling or guiding
174 Roll strippers
175 Roll bearing guards
176 Roll pairs

Figure 5

ceived, and it is hardly ever perceptible in the first view. Therefore, they should be magnificent, at least in the view of John Stewart Mill.

Mr. Green: When I was a member of the examining force (which goes back to pre-World War II) my colleagues and I used to speculate quite a bit about what was behind the decisions of the Classification Division. You know, did they toss a coin? Did they turn a card? Did they roll the diee? Now, over twenty years later I learn that there is a sort of rude logic in what they do.

Our third speaker is the Honorable L. F. W. Knight from the United Kingdom. He is Superintending Examiner in the United Kingdom Patent Office, and his extensive career encompasses Cambridge University where he took his degree. He is a physicist, a chemist and a barrister. His record in the Patent Office spans the period from 1930 to 1961 with time out for some war activity in the Ministry of Transport. Currently, he is in charge of all classifications, mechanization and the examining divisions. He was Chairman of the United Kingdom's Study Group on classification, and this afternoon he will describe to us the report of that group. The Honorable L. F. W. Knight.

Mr. Knight: Mr. Moderator, Ladies and Gentlemen: Almost exactly two years ago there was set up in the United Kingdom Patent Office a Study Group to inquire into and report upon the classification system and problems arising from it. Of that Study Group, as your Moderator has told you, I had the honor to be chairman. The terms of reference of this Group were very wide indeed, including power to recommend changes of any sort in the system, and to advise on long term requirements for proper control of clasification. The Study Group felt that it must look into other systems in addition to our own, and that its province included filing systems and aids to searching as well as classification proper, but that it did not extend to mechanical retrieval systems *per se,* although these could not be ignored since their use clearly affects the type of classification required.

Whilst we realized, of course, that there was a public interest as well as an examiner interest in the classification system, we concluded, and I quote from paragraph 123 of our report: "So far as examiners are concerned, the purpose of the classification system is to enable them to make as quickly, economically, and reliably as possible, the investigations prescribed by Section 7 and 8 of the Patents Act, 1949." With Section 8, which relates to prior claiming, I need not bother you, but I must, I think, quote the relevant part of Section 7. I quote: "The examiner . . . . . shall make investigation for the purpose of ascertaining whether the invention, so far as claimed in any claim of the complete specification, has been published before the date of filing of the applicant's complete specification, in any specification filed in pursuance of an application for a patent made in the United Kingdom and dated within fifty years next before that date." Section 7 (2) extends the scope of the investigation at the Comptroller's discretion to any other document excepting only patent specifications of any country which are more than fifty years of age, or any abridgement or official extract officially published of such specifications. It will be noted, then, that the scope of our search differs from that of some other countries in certain respects. First of all, we search only for what is claimed. We rely absolutely on the claims to determine the scope of the invention, although the descriptive part of the specification may be called in aid to interpret the claims. Secondly, the search we make under Section 7 is purely a novelty search. Thirdly, our search is statutorily limited as far as patent specifications of any country

whatsoever are concerned to a period of fifty years preceding the date of the specification. Fourthly, we are only bound, statutorily, to search United Kingdom patent specifications. Any extension of that search to specifications of other countries or to literature generally is at the discretion of the Comptroller.

It will also be appreciated that for over fifty years we have had a rather more elaborate general filing system than, I think, any other country, a system which might even be regarded as an embryo mechanical searching system. And as a result of this, and of the limited objectives of Section 7 of the Act, searching does not occupy even now a very long time in the United Kingdom Patent Office. The average throughout the Office is only about three hours per application. On the other hand, despite the comparative shortness of that period, we think it is much too long and one of the objectives of the Study Group was to see if we could reduce that three hours to one hour.

With this preamble over, I now propose to turn to the Report itself. The actual report is a document of 129 foolscap pages. I am not permitted to give you copies of it, and in any case I am quite sure you would not want them. It was signed and presented on the 9th of August 1961, but it has not yet been published. Some of its recommendations have, however, been accepted, whilst others are still *sub judice*. None as yet have been turned down completely. Despite the fact of non-publication, I am, however, authorized to summarize at this meeting the work of the Study Group and those recommendations embodied in the Report which have any bearing on the subject matter of this Workshop.

What I propose to do is to read or summarize parts of the earlier sections of the Report, which are factual statements of present positions, since without those you might not appreciate the point of some of the recommendations for change, and then to tell you the gist of our main recommendations insofar as they relate to our present topic. There are many other sections of the Report that I would like to deal with, but this would take far too long a time. I will merely mention them in passing. I would, however, ask you to bear with me if I diverge to some extent from classification pure and simple, since I am primarily reviewing the Report and not describing to you the United Kingdom classification system.

The introductory section of the Report and that part of the first main section dealing with the history of classification in the United Kingdom, and with the Comptroller's obligations and powers I can pass over. But I must go into the present classification system as described in paragraph 19 onwards of the Report if you are to appreciate the relevance of our recommendations. I therefore ask you to bear with me while I read a rather lengthy passage from the Report itself:

"The classification system comprises the subdivision of the whole field of patentable invention into a large number of pigeonholes relating to more or less definite subjects, and the rules, written and unwritten, by which a specification is indexed, i.e., its subject matter is allocated to the pigeonholes. The physical expression of the system is the Key, the Reference Index, and Office Practice," corresponding very much to the three volumes in the American System, I believe.—"The products of the system, and matters closely related to and dependent on it, are the search files, abridgement volumes, the subject matter index in the Official Journal (Patents), classification codemarks on printed specifications, and the punched card system for recording and reproducing the index and allotment of specifications.

"The Key is essentially a list of divisions of subject matter which may form the subject of invention. The primary divisions are headings denoting more or less definite fields of invention, and these headings, over 1400 in number, are collected into 270 numbered classes, themselves assembled into 44 numbered groups for the purposes of abridgement publication.

"Almost all headings are followed by one or more of the following items: qualifying notes in parenthesis, excepting notes, italic notes, and cross-references directing attention to other headings."—I hope you will remember that our term "cross-reference" in the United Kingdom has very little connection with the term as used in the United States Patent Office. It indicates in the United Kingdom the place where you will find that subject matter. It is an entry in the Key itself saying that such and such subject matter is taken out of this heading and put somewhere else. That is the meaning that we give to the term "cross-reference".—"Most headings are also followed by subdivisions within the scope of the heading and many of these subdivisions have subsidiary cross-references and are further subdivided, often in successive steps to increasing degrees of fineness. Each level of sub-

division is shown by indentation, and its degree is shown by the number of dots which precede the subdivision."—We have rows of dots corresponding roughly to your vertical lines. We prefer horizontal dots for some reason or another.—"Each undivided heading and each ultimate subdivision of subdivision of subdivided headings is labeled in the margin with a clasification code-mark."—That is another difference from your classification system. It is only the ultimate subdivision which is numbered. If a subdivision has further subdivisions then the higher subdivision is not numbered.

"The groups may be regarded as forming the largest units of classification. Their sole practical value, however, is in classifying abridgements for publication in separate volumes. They have no other real classification function; for instance, no use is made of them as a stage in deciding where any matter should be indexed. The scope of each is undefined and is merely the sum of the scopes of the classes which it comprises.

"The 270 classes are the next largest units of classification. They, too, now have no real classification function, and their main uses are in the distribution of search materials and specifications for examination to the examining groups and in the arrangement of recently published specifications in the library. The scope of each is, again undefined and is merely the sum of the scopes of the headings which it comprises. Their number order has no practical significance and arises from an original alphabetical order.

"The 1,400-odd headings are the largest units which have any real classification significance. The majority relate to particular fields of use such as specific industries (e.g. Pottery, Manufacture of) or machines (e.g., Typewriters etc.) which are distinct from one another, but there are a number (e.g. Bearings etc.) which relate to matter having applications in the fields of other headings. The two sorts are frequently called by examiners, rather loosely, 'application headings' and 'general headings'. These terms are relative rather than absolute. . . .

"Each heading is intended to have a more or less difinite scope, but the determination of this is a highly sophisticated matter. . . . The breadth of headings varies widely from one to another, and some which are broad in their terms have excepting notes and cross-references which exclude most of the matter that they would otherwise cover, and consequently comprise only residual matter.

"Italic notes which have been increasingly used in recent years are mostly intended to elucidate in one way or another the scope of the heading, by defining or explaining it, or saying what it includes or excludes, or some combination of these things. A few of them explain rules for indexing under the headings where they appear, or say what is repeated under another heading." In other words, the heading in the Key is explained in the Key. There is not a separate explanatory booklet.

"Cross references are of two sorts. One sort indicate where accessories, details, and other matter cognate to a heading are indexed. The other sort exclude specified subjects which are within the terms of the heading or subdivision and transfer the matter specified in the first part of the reference to the heading or subdivision specified in the second part of the reference." Both are excluding—they exclude subject matter from the original heading, but one excludes subject matter we would expect to find there; the other excludes the accessories and details which you might not expect to find.

"Each subdivision, like a heading, is intended to have a more or less definite scope.

"The scope of a heading is initially indicated by its terms in conjunction with any italic notes, excepting-notes, and cross-references appearing under it. The excepting-notes and cross-references as stated above indicate matter that is not indexed under the heading under which they appear. The effective scope of the headings, so cut down, is further affected by cross references under other headings (no indication of these is given under the receiving heading) and by certain rules and practices in indexing.

"The first of these rules is to treat the heading as though it were restricted by an indefinite number of unwritten but implied references concerned with features which, though given a particular application in a particular specification, are regarded as of such an obviously general character that they could not appropriately be indexed under any heading relating to a particular field of use (33 examples of these are given in an explanatory note which prefaces the Key)." To give you an example, one must always assume an implied reference to 'alloys'.

"The second rule is not to allow the mere *form* of wording used in the heading to exclude matters closely related to its substance, unless of course there is another heading which clearly takes such matter. Thus, subject to the proviso just mentioned, a head-

ing restricted in form to processes is regarded as also covering apparatus and materials used in performing the process, and a heading worded to cover only apparatus or substances covers also processes and apparatus used in making or treating the apparatus or substance.

"The third rule is to interpret the wording of the heading not literally, but primarily as expressing a central idea around which similar subject matter may be grouped.

"In addition to these rules, the following seem to be the main rules used in indexing: (1) Everything that is described in a specification that is likely to be of interest to a future searcher, whether it is strictly relevant to the invention claimed or not, should be indexed. (b) In deciding what is likely to be of interest the practice is generally as follows: (i) If the matter is well known and represented in the search-files of the heading and is at the same time not closely related to the claims of the specification being indexed, it is not *per se* of sufficient interest to that heading. (ii) The mere mention of a particular detail or element of an apparatus or process does not by itself (with a few exceptions) make it of sufficient interest to a heading to warrant indexing under it. (iii) Under many headings which cover the apparatus or process as a whole, a practice similar to (i) and (ii) is applied in deciding whether to index a detail or element. (iv) There are numerous exceptions to (iii); their extent is not certain, and the areas in which they occur and the forms they take are rarely indicated in the key. Under some headings any combination of elements, considered as one whole, is met, not completely in one particular subdivision providing for such a combination, but under the subdivisions for the various elements, even if each element is in itself well known and perhaps not even described. This is done to facilitate searching by using a combination of subdivisions representing such elements (combination-clip searching) which is, to some extent, the forerunner of mechanical searching systems. In other headings, features without novelty in themselves are indexed in subdivisions at a certain level only if there is novel matter of interest to an associated subdivision on the same level. (c) Any particular feature of interest, whether it relates to a detail or a complete process or apparatus, is usually indexed under one heading only, although in some cases it may be indexed from different points of view in two or more headings. In any one heading it may be indexed under one subdivision only, or under more than one subdivision if the heading has several sets of subdivisions corresponding to different aspects of the subject matter (e.g. shape, material, purpose). (d) If there is no clear home for some matter, the nearest suitable one is chosen, or the Key is modified or amplified to take account of the matter in question. (e) A machine or apparatus described as a whole should be indexed under a heading or subdivision which denotes the kind or type of machine or apparatus. No similar rule explicitly exists for processes. Even for machines or apparatuses it is not uncommon for there to be no heading which covers the whole machine or apparatus, and recourse is then had to indexing under headings covering the parts. (f) In a machine or apparatus described as a whole, details which are described and which have an interest beyond their mere application should be met under detail subdivisions or, when appropriate, under other, general, headings. (g) An improved article, whether or not it results from the use of a process, apparatus, or machine, indexable as such, is indexed under the heading relating to such article."

That is the greater part of the section of our Report setting out the present system. There are another seven or eight paragraphs, but they deal with such small details that I do not think I need bother you with them. I am sorry I have had to read all this *in extenso,* but without it I do not think you would understand the purpose behind our recommendations.

I am now going to skip some 220 paragraphs of the Report in about thirty seconds, I hope. We next went on to review other systems, notably those of Germany, the Netherlands, and the United States, none of which reviews I will, or scarcely dare in this company, read. We also reviewed the International Patent Classification which my friend, Rubach, has already dealt with most competently this afternoon. We also reviewed the history and present work of our classification sections, the question of present day responsibility, and the extent of reclassification undertaken in recent years. That was the extent of Part I of our Report.

It was followed in Part II by a detailed, critical appraisal of the system as it stands at present, its characteristic features, the conflicting requirements of the public and the examiner, the complexity and illogicality of the present system, the apparently contradictory needs of stability and flexibility, the structure of the Key and of the Reference Index, the

impact of mechanical searching, filing systems and other aids to searching, unofficial classification schemes, problems of the scheme of headings, problems of individual headings, problems of subdivisions, problems relating to particular types of headings, such as general and application headings, compositions, articles and materials, and so on, specific problems between headings, and finally, internal problems of particular headings.

Then we come to the third part of the Report, which embodies our recommendations and a good deal of that I propose to read to you. In paragraph 267 we say: "After careful consideration of possible alternatives, we do not recommend any major departure from the method at present in use," the present method being to define such features as precisely as possible by descriptive wording.

The next recommendation appropriate to this Workshop is that every item of subject matter in a patent specification should be indexed. "We consider it essential that this practice should remain unchanged. . . . Claims can be, and frequently are, made for combinations of features, some or all of which may be known *per se,* and for minor improvements in articles, apparatus and processes of known type, and in these circumstances failure to index features, because they are considered to be incidental to the invention, or do not relate to the apparent inventive step, would clearly reduce the effectiveness of the search."

The next one: "We recommend the provision of a logical or substantially logical superstructure to the scheme of headings in place of the present abridgement groups and classes, which have no real classifying function. This would enable the correct home for any particular item of subject matter to be determined by reasoning process, and would facilitate amendment of the Key to provide for new matter. . . . We also recommend that in the interests of simplicity, comprehensibility, and economy, the number of headings should be drastically reduced, e.g., to about 450.

"We are also of the opinion that the system should have some relationship with the I.P.C."—The International Patent Classification—"As the latter is not entirely logical from our point of view, this raises the difficult question as to whether or not logicality should be sacrificed in order to secure a reasonably close relationship between the two systems. We have devoted much careful thought"—or so it says in the Report—"to this question and have concluded that the examiners' system should be brought into close agreement with the I.P.C. (at least at higher levels of classification) even if this involves some departure from logicality in the proposed superstructure to the scheme of headings.

"Accordingly, we recommend that the first stage of classification should correspond to the eight sections A–H of the I.P.C., the second stage should be represented by 41 divisions, each corresponding approximately to a single class or group of adjacent classes of the I.P.C., and the third stage should comprise about 450 headings arranged as far as possible logically within these divisions. The scheme of headings should be produced initially by condensation of the present scheme with the minimum disturbance of existing major headings. The proposed 41 divisions are listed in appendix G to the Report. . . .

"The scheme of headings should be made as comprehensive as possible to avoid undefined gaps and to enable subject matter to be indexed freely from different aspects. In the past, much valuable indexing information has been deficient in these respects, and we are strongly of the opinion that this should be avoided in the future, particularly in view of the possible advent of mechanical searching on a large scale. The simplified scheme of headings, detailed in Appendix H, is not comprehensive, having been produced by condensation of the existing 1400-odd headings. We regard it as a possible step toward an ultimate goal. . . . Subject matter should not be indexed in a specific heading which does not strictly cover it unless the heading in question is amended immediately. If such amendment is inconvenient at the time, the subject matter in question should be temporarily accommodated in an associated miscellaneous heading which should be reviewed at frequent intervals.

"Pending development of the I.P.C. from its present embryo form, we are unable to predict the extent to which it might ultimately be used by the examiner for search purposes, but we doubt whether it will even be developed in sufficient detail to provide by itself a satisfactory substitute for our present type of system. However, if a class or subclass of the I.P.C. provides a suitable unit which could be adopted as a heading, we recommend that it should be adopted when and where convenient, and if the I.P.C. provides a suitable basis for the subdivision of the heading, we suggest that it should be made-use of when that heading is re-classified, unless there are compelling reasons for adopting a different course. We express the hope that, by

development on these lines, the structure of the system used by the examiner will gradually approach the I.P.C. The ultimate objective might possibly be a system which incorporates all or most of the I.P.C. subdivisions, but is modified or amplified in detail as necessary to suit our particular requirements."

There then follow in the Report the more detailed recommendations regarding the form and interpretation of headings and subdivisions, and the recommendations relating to specific headings. These, I am not going into, but I would direct your attention to one or two of our later recommendations. In paragraph 314: "Whenever major reclassification of a heading is proposed, we recommend that the possibility of utilizing punched-card or equivalent records for search purposes should be carefully explored and if considered expedient, the new classification should be made suitable for their employment.

"Steps should be taken to educate examiners in the use of Batten and similar systems and to encourage them to adopt a less conservative attitude towards nontraditional methods of searching." I do not know whether you get such examiner resistance in the U.S. Office: We do in the British Office.

"Pending further development of mechanical searching within the Office, we recommend that research should be carried out to ascertain whether the existing cards and clips could be modified to enable a greater amount of indexed information to be presented to the searching examiner in a convenient manner.

"Examiners should be trained to appreciate the various ways in which search files can be organized to enable search time to be reduced, or searches to be made more effectively . . . and should be provided with more detailed information on the use of colored clips and the employment of various other searching aids."

Another recommendation to which I would like to draw your attention, although it has strictly nothing very much to do with this meeting, is this: "We recommend that a training scheme should be instituted whereby selected examiners should be attached to Classification Section for a period of (say) 18 to 24 months to receive instruction and at the same time to assist in the general work of the section." We suggested this training should be carried out when an examiner has been in the Office from five to ten years.

I won't keep you much longer, but I would like to read those parts of the Report which deal with our proposals as regards the duties and powers of the Classification Section; I do not think it will take me very long. "We recommend that Classification Section should continue to check the correctness and completeness of index and search, at least down to heading level, of all specifications at the acceptance stage, and that steps should be taken to investigate how far this procedure needs tightening up. In our view, the check will be particularly necessary if and when the changes resulting from our previous recommendations are put into effect.

"We also recommend that Classification Section should make a similar check of the I.P.C. Index when the latter is done by group examiners.

"We recommend that the section should have power (a) to determine the scope and wording of each heading in the Key and of the boundaries between such headings, (b) to decide the headings in which any specifications is to be indexed and searched, (c) to direct that a particular specification be examined in a group which is not responsible for the primary search files, e.g. where specialized technical knowledge is required, (d) to issue to the examining staff, instructions on classification, searching and indexing and to resolve disputes on their interpretation, (e) to approve of any proposed internal classification of a heading; major changes should be subject to approval before the work is started, (f) to direct that internal reclassification of headings should be carried out, (g) to direct the lay-out of search files and the use of mechanical search systems, (h) to allocate classification time within an overall allowance of time for the whole examining staff, (i) to examine or search specifications, e.g. if a new classification problem is presented or it is desired to ascertain the state of classification in any particular field, (j) to require the furnishing of information for classification purposes, and in particular to direct that searches should be made for these purposes.

"We also recommend that Classification Section should have its duties extended to include the following: to plan and supervise the transition from the existing classification system to a modified system proposed in this report; to discover and investigate defects of the system, in particular, by (i) periodical examination of statistics relating to the number of indexes and searches in each heading, with a view to abolishing or revising headings in which both are low, or in which there is a wide dis-

parity between the number of indexes and searches, (ii) the maintenance of records of subject matter which cannot be adequately indexed under the existing scheme of headings, e.g., inventions which can only be indexed under a miscellaneous heading, inventions which are capable of general application or use which can only be indexed under application headings and specified applications of inventions for which there is no provision in the Key, and (iii) periodical preparation and examination of statistics relating to the average search times in the various headings; to initiate proposals to remove, as far as possible, the defects so discovered, and to direct that a heading should be reclassified if the average search time is considered to be unnecessarily long; to cooperate with examiners in the implementation of reclassification schemes." In the past it has been the practice for the examiner in charge of the class to carry out the actual classification, although subject to advice from Classification Section; "to revise and sanction all proposals for amendment of the Key; to advise on layout of examiners' search files and the use of colored clips and other searching aids; to maintain an up-to-date Reference Index; to control and develop mechanical searching; to advise on the administrative setup of examining groups," and one more recommendation. But I pause here for a brief moment before reading this last recommendation on the duties of Classification Section, since it is particularly appropriate at this very meeting that we find this prophetic recommendation implemented—I quote: One of the duties is "—to consult with other Patent Offices and with other classifying bodies on problems of classification and the use of searching aids."

Mr. Moderator, Ladies and Gentlemen, I thank you.

Mr. Green: That was a very rewarding presentation. I think we now have the opportunity for the coffee break which will give you a second opportunity to think up some very difficult questions for our three speakers when we return. I believe we ought to be able to get back here in twenty minutes without any difficulty.

A short recess was called by the Moderator.

Mr. Green: I have been told that the conversations that were going on in the Delegates' Lounge during the intermission were as rewarding as any other part of the Session, and I am confident that this is true. So, perhaps we might aim to conclude our formal discusion in about half an hour, and for those who wish to carry forward, the quarters are here and I am sure you will be seeing a lot of each other for the next couple of days. The ground rules are relatively simple. As you know, these proceedings are being recorded. Therefore, it would be desirable if you would speak up, ask your question, make your observation and identify yourself.

Now, the Program says that the round table discussion is going to be limited to two topics. Of course, that is not so at all. Let's talk about anything that is pertinent.

Mr. Rotkin: This is not in the nature of a question as much as bewilderment. The speakers today have touched upon the classification systems that exist, or that they would like to see exist. But no one, as yet, has spoken about how such a classification system is created. In line with the first topic for round table discussion, I think it would help, if we were to give some thought and vocalize on the techniques or mental processes that go into the creation of a classification scheme. Not how one encodes or allots the pigeonhole notation on a patent into an existing system, because if we were to find that in fact we have the same mental processes in creating our classification system, it might be easier to get together in a somewhat universal classification system.

Mr. Newman: One of the most useful methods of classifying is to take like things, discover their differences, and use the differences as items in a hierarchical classification system. This actually, in my personal belief, is what the Classification Division of the U.S. Patent Office does, when it synthesizes its classification schedules. You make piles of documents concerning similar things. You study them and find out what their differences are. You then list these differences as elements in the classification schedule. This is one of the ways in which one can develop a highly usable classification system, because it is these differences which continue to grow, and you must make place for the thing that is going to come into being tomorrow.

Mr. Green: Does any one of our vistors from abroad wish to comment?

Dr. de Haan: It is with the greatest interest that I listened to the addresses of Mr. Rubach, Mr. Vincent, and Mr. Knight. I see that, more or less, they have defended a certain classification system with which they are acquainted. The first speaker asked, why it would not be possible to come to a coordination. Listening and thinking about the

remarks made by the speakers, it reminded me of Shakespeare who said somewhere that there is nothing either good or bad but thinking makes it so. It strikes me always that only very higly intelligent gentlemen deal with classification. I can understand that having thought for many years about their own classification systems they each think that their own sysem is excellent. But on the other side, it might be that these same intelligent gentlemen considering other classification systems which depart from their point of view, might think that these classification systems are partially or totally inadequate to their needs. I may, too, say that they might think these systems bad. And so I fear, although the U.S. system, the U.K. system, the German system, and the I.P.C. in themselves are very good systems, with which examiners who have studied the systems can work, it would be very difficut to work them together. And I am not very optimistic that the existing classification systems for hand searching can ever be brought together. Throwing away your own classification system and replacing it by another system gives such a lot of work and expense that for practical reasons only it might be impossible. But we have heard that with hand search classification it becomes more and more difficult to search the enormous number of applications and the enormous amount of documentation, and that in one way or another, we must come to mechanical classification work, which is also one of the most important topics of this Workshop.

I should like to draw your attention to the fact that if we introduce the mechanical system for searching, we have to throw away our existing searching systems. And if we try to work out a mechanical system which, as I feel, is a very, very difficult thing, and which will take many years, it can only be accomplished by very intelligent classification gentlemen in the various Patent Offices working together and thinking together, in the same way. What it may be is a second question. But only if they think together, can we get one mechanical system that is the same for all our Patent offices, and which we will all think is really a good system. We would have the great advantage that communication of information among the Patent Offices and documentation of industry in our various countries, could be done on the same basis and that we could economize to a great extent on expenses and labor.

Mr. Green: It seems to me that the logic of what has just been said is obvious. When you enter into machine language, your vested interests in specific classification systems should merge into a new system. If I might be permitted I would like to tell you of a little work that is going on in the United States now, not in the Patent field, but directed toward exactly what you described. In the Federal government we have a number of documentation services, one in the Defense Department, one in the Atomic Energy Commission, one in the new Space Agency, and one in the Department of Commerce under my jurisdiction. Four agencies are going ahead to mechanize in a compatible fashion so that we can exchange tapes, so that we can merge our effort, so that we can divide the operation. We find that this is working in a most effective fashion in the early stages. And it just seems natural logic. Well, if I may be permitted this intrusion, any other observations?

Mr. Ueland: In Norway the examiners have to deal with three filing systems, the German system that we follow, the American system, and the Dutch system. All British and French patents are classified after the Dutch system. It would simplify the examination of novelty if all patents were classified according to one classification scheme. I understand, of course, that this is difficult because in most European countries the inventions are classified according to technical use of the invention, while in the U.S.A. most of the patents, I deem, are classified on the object and, I suppose, of the object's end use. In a few years I presume all the European patents will be classified also according to the International Classification system, and in that way retrieval of all patents will be easier. I should like to know if it would not be possible to glean from the U.S. patents, in addition to the U.S. class, the International Class designations. Because of the great number of patents granted here, the U.S. material has been, and will be, an important searching material, but it is very difficult for us to use it. The U.S. Patent Office very often changes its classes. Some classes disappear. Some new classes are formed and patents are transferred from one class to another. It is extremely difficult to retrieve the patents after all the changes are made. An example—Class 13, Electric Furnaces. A number of patents from that class are spread over fifteen new classes. I suppose that after a complete International Classification system is introduced, there will be a few changes for some time to come. By printing the International Classification on the U.S. patent, some stability in the classification will be obtained and the retrieval

will be easier. It will be of the greatest importance for international patent cooperation.

Mr. Green: I think possibly the answer is that this is something for the Commissioner of Patents to study, and I doubt that an answer can be given this afternoon.

Mr. Rubach: But this question was often placed before us. The industry and the agents come and ask if we could not give them a correspondence list between the German classification and the classification of the U.S. Patent Office. We have tried a lot of times. It is absolutely impossible to make a correspondence list because of the way in which we classify, even in the International Classification system and the way in which the Patent Office of the U.S. classifies. I must say I would appreciate it very much if this would be possible. But I might also say I can not imagine that the U.S. Patent Office could do that.

Mr. Green: My own impression is that the only people who think it can be done today are the bright young men who sell computers.

Mr. van Waasbergen: I would strongly underline what Mr. Ueland has said, because the classification of United States patents in the diverse European Patent Offices is a big problem. The United States Patent Office patents arrive at The Hague and in Munich, and in Stockholm, and in many other places, and if you want to have a consistent classification system at all these different places, reclassification must be done. That is to say, at several places, exactly the same work is done. It would be much better if the work were done once in the United States Patent Office itself. If the United States Patent Office could print the index of the International Classification that would be a very big advantage for all the other offices which are going to use the International system.

Then, I would like to add a few words about the possibility of a concordance. You said, Mr. Green, that perhaps with a computer it could be done. I do not think this is true. If you consider one system of classification, for instance the International system, you could express it in a graphic way. I say, you divide the arts in horizontal rows. But if you have, for instance, the United States classification system, you do not divide it horizontally, you divide it vertically. And it is quite clear that it is impossible to find a horizontal row which corresponds to a vertical column. So, the concordance, in principle, in my opinion, is impossible. The only way to get the indexes of another classification system is that we have the men who know it and want it, and the men of the other system classify it and put the indexes on the paper.

Mr. Green: My comment was facetious. I was intending to say that only the people who sell equipment will promise you that they can do this, and not the people who do it.

Mr. Fairthorne: As one who has been a computer or computor, for over a quarter of a century, I am in the unusual position of defending computing machinery, because I generally attack very vigorously on this thing. I would say there is very good hope, indeed, in the not too far future, for the use of computers to allow a lingua-franca international form of classification for use, subsidiary to what any particular national patent office or indeed any national library uses. The problems of making concordances and so forth are very considerable. And what you call a concordance in this particular connection is something very much more elaborate, of course, than anything that the Jewish, for instance, make a concordance in the Bible, of which we have had some practice, because if my memory serves me right, one of the earliest belongs to the sixteenth century in the book of Rabbi Isaac Nathan. Well, we need something more elaborate than that. But, although it hurts me to say so, the contemporary machinery can do quite elaborate work of turning things of one structure into another, provided they have enough capacity, enough storage. Current computers, indeed for the next two years, will not have anything like the amount of rapid access storage for what we have in mind. In the next five years I suggest they might. It is not like waiting for an artificial intelligence to come out of a tin box or anything. It is a question of simply how big they are going to get. And I would suggest, therefore (again, it goes against the grain) that people forget about computers in searching here (which in my opinion and some others, is the least important of all the applications of machinery in this field) and consider its use for converting classifications, revising classifications and so forth as bits and pieces come in. For that sort of work even contemporary machinery can be quite useful, and I should say that in three or four years will be a great deal more than quite useful. It will allow any particular classification to be represented, in standard form, should I say, whatever people care to use

in their own countries. This, admittedly, is speculation, but I do not think it is unreasonable.

Mr. Green: Thank you. That is a very useful observation. Any further discussion?

Mr. Jeffery: As a representative of quite a small patent office, it is with some trepidation of course, that I dare to open my mouth here, amongst the computers and classificationists. But we have had some experience with two classifications, the Australian and the International. And we find after two years, that it is impossible to have a concordance in the sense that, if this is the Australian classification, this must be the International classification. There is not a one-to-one relationship. But let us get right back to what is the purpose of classification. It is to help searchers in the future. Now, a searcher is searching for some specific subject. Could he not have an international word list, or subject list, whereby, if he ran down the column and came to the subject he was searching, which might be, say, alloys, magnesium, aluminum, and running across he sees the various classes under the different countries. You see, it is back to front. He approaches with a word and he finds the class. So I throw this one in for general discussion.

Mr. Newman: We have a possibility here of getting a partial concordance. The U.S. examiners classify the foreign patents in their own classification scheme as they come in, and we have at the present time in the U.S. Patent Office a Hollerith file of foreign patents and their U.S. classification. Now, it seems to me that somebody could get hold of these decks of cards and resort them, other than by country. One could have at least, a list of those foreign classifications in which the majority of patents were coordinated and also a list of where a U.S. patent classification or a foreign patent classification did not overlap.

(Further discussion brought out the fact that this classification was uncontrolled, since it was applied by individual examiners, and was therefore too variable for serious consideration.)

Mr. Rotkin: I might comment, Mr. Newman, that I tried that on a very, very small scale when we first got the printed copy of the International Classification scheme. I could not find enough coordination to say that there was a majority of anything. In other words, the divergence of the numbers, in the small area I looked in, made me despair. I would like to see it tested a bit more rigorously and scientifically. I would like to add just one further thought. The suggestion of putting the International Classification on the American patent, I think, is a matter of manpower, or, to be more fundamental, dollars and cents. It would take some three or four men, versed in the various mechanical, chemical, and electrical arts, to actually do that encoding, because it is strictly a question of encoding. There is no creative work involved. You have to be familiar with the classification, that is, the International Classification, and know enough about the technology to determine where it fits into that classification. The problem, though, I think goes beyond that. A single notation would show up even more alarmingly the difference in the basis on which patents are issued. In the European system, particularly in Germany and in Switzerland, you have the so-called single entity of thought without embellishments in a patent, as distinguished from the American patent which has a terrific variety contained in the claims of the same patent. If you did not provide for additional copies, each one of which had its own separate encoding for every variation and for every claim, you would lose most of the disclosure. Now, the additional copies would compound terrifically the time and the expense involved in putting the International Classification on these copies.

Mr. Green: Admitting that this is a problem of a great deal of complexity and difficulty, if this many representatives of foreign patent offices think that it is a serious problem, I believe that this conference should call it to the attention of the Commissioner of Patents, and ask him to seriously study it and see what can be done.

Mr. Oredsson: Listening to the discussion, I got an idea similar to Mr. Newman. There are a lot of applications, priority applications, filed in a lot of different countries. Let us take, for instance, in Germany and in the U.S.A. Would it not be possible to identify, by, for instance, the titles and the inventor, the patents which are granted on these applications, and just try to find out where they are classified according to the German system and the U.S. system, and in that way perhaps it would be possible to work out some sort of concordance between the two systems.

Mr. Green: We will add this suggestion in the recommendation that we make to the Commissioner of Patents.

Dr. de Haan: Mr. Moderator, as to the indexing of U.S. patents with the International symbol, I think that we Europeans, who are beginning to use the International Patent Classification, must not bother the American Commissioner with the task of putting these symbols on their own patents, for two reasons. In Europe, in my office, and, I think, also in the German office, we have been classifying all American patents into our own patent system. I think if we have a common classification, we should come together and divide the task and ourselves put the I.P.C., the International Patent Classification, on the U.S. patents. Also for a practical reason, because (and I heard it also from one of the last speakers) for a classifier who is not accustomed to a classification system, it is much more difficult to put these symbols of foreign classification systems on the U.S. patents than it is for a classifier who really uses the International Patent Classification. So for the question of economy, it is far better that we do it ourselves than that we ask the U.S. Patent Office to do it.

Mr. Rubach: I would only point out that even if you have an American specification and a German specification that may be a branch specification, you might go back to one particular inventor and one invention. But if you see what is left at the end you will see that what we call the invention, is absolutely different in the other country. Therefore, it is of no use to make comparisons.

Mr. Oredsson: I do not see that it makes any difference what the invention is in this case, because now, I think we are talking about documentation, a sort of concordance. And the disclosure in the specification, I think, would be rather similar in both countries.

Mr. Green: Do we need to pursue this further? Or can we go on to something else?

Mr. Oredsson: Let me just add another thing. By picking up this sort of duplication in different countries, you could perhaps withdraw some of the patents in the source file, and you would reduce it to rather a good extent.

Mr. Green: Are there any other observations on this point?

Mr. Pfeffer: It seems to me that if we are getting into a discussion of concordances, that we are taking the easy way out here, and overlooking the main issue. It would seem to me that the gentlemen from Norway, Germany, and the Netherlands, who have indicated the desire to have the International Patent Classification put on the U.S. patents, are in a subtle sort of way indicating a desire for some sort of standardized international classification. I believe that this should be one of the real issues that we ought to be discussing here. In listening to the descriptions of the various systems that were discussed today, I found some basis for some work in the future. It appears that they are not completely at odds with each other. Whether you start from a system based upon use and develop your general classes afterwards, or whether you start with the general classes of function and develop special uses later on, we eventually will arrive at the same point. So there is quite a measure of similarity here, and it seems that this would form a basis for some future activity in trying to establish some real international standards.

Mr. Jancin: A thought occurred to me during Mr. Knight's talk in connection with his statement, that a search is limited to about four hours, if I remember, and that they are trying to get it down to one hour, and that their search by statute is limited to U.K. patents, and that it may be extended by the Comptroller. Isn't this due in a great part to the practice in the U.K. of oppositions and to the main claim procedure practice they have? Now, I think the answer is this is "Yes". That is why I make the further observation that such things as this may have a great effect on this whole matter of classification. There are different bases and these have to be recognized before we can get this thing on an international scope.

Mr. Green: I assume you would agree, Mr. Knight?

Mr. Knight: Yes, Mr. Moderator, I think our opposition procedure has a great deal to do with this, because in the opposition proceedings the opponent may bring in a specification from any other country or any other piece of literature he likes. That is, in effect, part of the official proceedings before the grant of a patent. It can be regarded, in a way, as part of the official search, although done by the opponent and not by the office.

Mr. Purdy: It seems as though we keep coming back to this divergence of interests in the search. Mr. Rubach and Mr. Knight both mentioned that within their classification systems there are two generally recognized kinds of classes, the general class and the class which is based more on art or technology and, as Mr. Knight put it, the general and the application class. Whereas Mr. Vincent pointed

out that our type of classification is tending more and more to be based upon proximate function which corresponds to Mr. Rubach's construction, function or purpose group, I believe. Now, there is no reason, of course, why we can not have two complete schemes of classification in which every document could be filed, except of course, for the overriding one of the additional space involved. And I wonder if it is possible, or if it has been attempted any place, to classify documents for hand searching on one scheme and follow it up with a machine search in the more naive scheme. I wonder if this gentleman who so kindly defended the business machines has had any experience in that direction.

Mr. Fairthorne: I do not know of any such thing done in that way, but the general feeling you have expressed, that a machine could do the rough sorting and human beings then get down to details, is one that is very commonly felt by even the most ardent machine defenders on the ground that you can produce a high concentration of what you want in a short time, and then get down to look for details. It is what Mr. Newman has said. You first look for roughly similar and then you look for the differences. That sort of thing is certainly possible. But all these involve impractical application, particularly in the Patent Office work, or any National Library. Enormous storage of group data has to be rapidly accessible. And rapidly accessible does not mean by writing it on tape, because writing on a piece of string is remarkably silly, even if you do write it with a magnet and pull the string very fast. So that we are waiting to have a great deal of much more rapid access static store in machines. I myself, this is a highly controversial point, feel that we cannot do that sort of thing really well on a big collection until we have some ten to the ninth valued digits in fairly immediate accessible form. That is an American billion, not a European billion.

I think we can do what you think, on a rational size collection. If you take a smaller collection, it is always quicker to do it by hand. That is one of these troubles. The small scale thing is not a proper model of the big one. And that is why we are having great difficulty with the mechanical search. We are too big for the small collections and too small for the big ones.

Mr. Pfeffer: In the Mechanized Examining Division of the Patent Office this goes on to some extent, particularly in the art dealing with steroids. Sometimes the examiner cannot ask a question which would give him a complete answer on the mechanized system, and he will very generally supplement his search by the use of the manual classification system. This is not unknown. Of course, this can de done with a system as small as that, but I have my doubts with respect to a very large scale system.

Mr. Purdy: I think that Mr. Pfeffer is giving us an example of what is more or less the reverse, or inverse, of what I was thinking of. You are probably examining or searching the more complex items of information with your machine, and going to the existing classification for use perhaps.

Mr. Pfeffer: No, I would say it is the other way around. The system is rather simple in its concept, and the more complex things have to be searched by hand, and the simpler things can be searched by machine. We have not yet reached the stage that you are proposing.

Mr. Green: I wonder if we have a problem yet that we can work on cooperatively. And this it seems to me is the theme of this afternoon's discussion.

Dr. de Haan: Mr. Moderator, I should like to have some answers on whether I am right in saying that our existing hand classification systems are so heavily loaded with tradition, that it seems very difficult to come to a general system for hand searching. But it may be possible that in the field of automation, since we start from the bottom anew, that we could come to an intimate collaboration in order that we get there altogether in the same line, developing this automatic search system which still has to be created.

Mr. Green: This seems to me vital. Are there any dissents? Do you want to make an observation?

Mr. Urbach: Not really a dissent. That is almost like condemning motherhood. I would say that I can see a problem coming in that area in line with some of the present research being conducted by the U.S. Patent Office group, in that there is a tendency to automate within the units of the existing classification structure, as opposed to looking at the entire area and automating all of it. If this tendency exists also in other patent offices, and I would guess that it does, we do not solve the problem by going to automation. We just substitute another technique for the existing techniques within the existing classification systems that are not compatible with one another.

Mr. Green: This is certainly true, but I believe Dr. de Haan is saying, that now is the opportunity to do something about this, and I think (I am not a member of the Patent Office, but I am confident that I am speaking for the Commissioner when I say) that the U.S. Patent Office would be happy to cooperate in an international group on this sort of thing.

Mr. Pfeffer: I think if we are going to deal with the problem of research, which Dr. de Haan must concede is the important thing here, that it would be rather difficult to try to allocate areas of research and say that, you work on this problem, and you work on that problem, and I'll work on the third problem. I think probably the best way to approach this would be on a team effort, where each of the contributing offices would supply manpower and have a unit, an international unit if you will, which will consider this problem, and be supported by each of the contributing agencies here.

Mr. Green: May I also suggest another device, the guest worker device.

Dr. de Haan: I think that the solution of automation is not one problem. I think that perhaps in chemistry, in electronics, in the mechanical field, you may ultimately have to use quite different systems, and perhaps the study of various problems which the experts must divide and must arrange, could be divided amongst various patent offices. They must give all their reports of their studies. They must interchange. In this way perhaps something might be done. I quite agree that an international committee would be very good, but the Department of Finance will intervene. At least in the European countries.

Mr. Green: Here, too. Our limitation this afternoon is problems in patent classification, but I assume that after the third day there would be some rather specific plan for collaboration in this area.

Mr. Lawlor: I would like to ask two fundamental questions here. One is a mere repetition of questions that have already been asked, and that is: Why can't you have multiple classification schemes applied to the same document? I see nothing wrong with this. It is a good thing. Then I would like to ask another fundamental question, and that is this: Is classification necessary? I am an advocate for assigning as many problems as possible to machines. I am an advocate of the full text recording system. I am an advocate of the system in which you would record the full text of the patent, or the full text of the key words that you assign to the patent, or the full text of the sentences that you use in abstracting the patents, and you never classify anything until you ask the question. When you ask the question, you ask the question in terms of the language that has been recorded. You find all of the pertinent documents and your search results are not prejudiced because somebody made an error in classification. Now that is really a question, not just an exposition. Is classification necessary?

Mr. Green: Shall we give our foreign guests a chance to answer first? Are there any in the group from abroad who would like to comment on this?

Mr. Fairthorne: This is certainly a clean problem in a sense, but the trouble is that it will hurt for practical as well as theoretical means of solving it for some time. But there is no reason why one should not start trying to do it now. I think anybody who thinks it is going to be a help in the next decade is perhaps rather optimistic. On the other hand, it is in the long run the only way you can deal with any retrieval problems at all, because the only thing that is constant in time is the marks you put on the paper. We are dealing with the marks that people make in a claim, in a book, or something of that sort. They are a set of marks. What we want to do is to tell a person or a machine, at a given time, how to recognize when he looks at the marked object that it is what he wants. We want to delegate to the machine the fact that we can recognize that the patent or document is relevant to whatever we have in mind. And that is very difficult. We do not know how we recognize it. But it has one great advantage. It does not involve prediction of the future in any way whatsoever. At the moment, not being able to do that, we do not know how to recognize things nor have we any means of looking at complete texts in a hurry. We get somebody to write on top of the document, marks which indicate how he hopes it will interest people in the future. Now there is not a fixed amount of information in a document, that you can squeeze out of it, like water in a sponge, although the electrical engineers believe that. What electrical engineers believe about these things is a matter we are not discussing here. There is just as much in a document as people are interested in at a given time, and, therefore, we cannot avoid having a good deal of prediction in any indexing or classification, which is a past expression of hope. And we can not avoid

leaving things out because the things we are really classifying are not marks on a document, but how we think people may be interested in it, and that is indefinitely large. So that, when we aim at treating the original text to find what is in it, we are not only following what we do ourselves, (most of us in fact read the text before we find out what it is about, and we are so used to it, that we do not think about this), but we are cutting out an insoluble problem, logically. Unfortunately, we will still continue, I am afraid, to have to make marks in a systematic fashion on top of documents, to indicate how we think they are going to interest people in the future, for quite a time. But do not let that blind us to the fact that, as we pointed out, in the long run we must be able to delegate to unintelligent agents, tell them how to recognize what we want in a printed text, because that is what we ourselves do. The text is there and it is the only thing that is permanent over the ages, barring wars and fadings. But I think all the work that has been done on this is very worthwhile. It will have to come some time. One big problem is mechanical handling of your texts, which come in all shapes and sizes and that, as a mechanical job, is almost as bad as the intellectual one. But there we are.

Mr. Green: It seems to me that those comments were summarized for me by one of the research examiners in the Patent Office when he said that the key word here is "riot". I said, "What do you mean by 'riot' "? And he said, "Retrieval in our time."

Mr. Purdy: May I try to answer the easier of Mr. Lawlor's questions? The reason why, I think, most Patent Offices, and I am sure it applies to our own, do not have dual classification is the space reason. If we had to add an additional document for two out of three we should have to make room for two million patents, and we are already bulging at the seams in the research room. We have tried to create dual classifications on a very highly selective and I should say guarded basis, which will help the searcher who is not interested in the same field that the patent examiner is, that is, duplicating something set before him, but who just wants to know what the state of the art is.

Mr. Green: Any additional observations?

Dr. de Haan: Mr. Moderator, I might ask of the speaker before the last one, is it not true that the mechanical search system makes it possible, through the machine, to have an unlimited number of approaches to the material contained in the documents?

Mr. Green: Do you care to speak to that?

Dr. de Haan: I mean that if you now have the hand classification, you have one approach, either through function or technology. But is it not true that in a mechanical system you have an unlimited possibility of approaches to get something out of the patent?

Mr. Green: You can enter the system in a number of ways.

Mr. Fairthorne: I do not think there is any doubt that given two conditions, that we can do this sort of thing up to a point by machine, far better than we can by using highly trained people. The conditions are first of all, of course, that the stuff can be read by a machine in some way or other. By stuff, I mean probably the index marks of people that have been made. But given a rational method, a reasonable method of marking up a patent to indicate our current interest in the world of today, (that is by any of the standards of classifications used by the various countries) you should be able to approach these marks from different points of view. Although there might be a great deal of computing to be done, real computing, in the way of changing structure, words and things in a way in which the linguists and others are trying to analyze now. We are, in fact, trying to see how people use words. Now, I am not a linguist. I am a mathematician. But I think even on simple matters, there is no doubt, that given the rules of recognizing the marks are what you want, and the fact that they are what you want, (which is not always clear) a machine of the type we have today can deal with this matter, although approaching it from different points of view much more quickly than a human being, in fact, does so. It is not for me to advertise my particular affiliation at the moment, but we do it pretty well. But mind you, it means a great deal of intellectual effort to put the marks on. But once they are on, we can get it out not as well as we would like, but we can do it.

Dr. de Haan: I think we cannot avoid putting in human intelligence somewhere.

Mr. Fairthorne: We do not want to use the same intellect on the same job over and over again. That is how the people have mapped it out. At the moment we have to, I would say, but the idea of having a common classification office, common inter-

classificating thing is to avoid intelligent, knowledgeable people having to do the same work over again. That is why we are here.

Dr. de Haan: Exactly. I think even with mechanical searching you have to analyze the documents.

Mr. Fairthorne: For a very long time. Current experiments are rather naive, and sometimes, if I may say, purely silly.

Mr. Green: It seemed to me for a long time that this problem of preparing the patent for machine storage is ignored to a great degree by the people who want to sell you a system. They say, "Once you have prepared the material, we will give you the system." But the main problem is getting the material together. And this should not be overlooked.

Mr. Urbach: In connection with Dr. de Haan's point again, of unified research effort, I would like to ask if there has been an exchange of what research efforts already have been made by the various patent offices, and if so, how does, let us say, a particular mechanized American system work in a particular foreign patent office, and if this has not been done, is this not a good place to start?

Mr. Green: My understanding was that it had not been done, but this is the time to start.

Dr. de Haan: But we have done so already. We have developed in our office, a mechanical system for searching carburetors and we have prepared a deck of cards. Mr. Andrews generously offered to try them. He now has the cards and he will complete the test in a short time I hope. But we have already made a study on this, just in the mechanical field because we thought that it was much more difficult than the chemical field, and we wanted to see if there was a possibility. We are very anxious to know the result of our work, because we have not at our disposition a machine which is sufficient for handling the cards we have made.

Mr. Green: I should mention that every representative of a patent office who attended this Conference was sent a questionnaire in advance and he was asked a number of questions, one of which was "What mechanization efforts are going on?" And this material came in, as you can imagine, at different time intervals and was just assembled last week into a very useful summary which, regrettably, is not yet available. But I have seen it, and it will be in the Proceedings and it gives the sort of information you are asking about.

Mr. Urbach: I do not think I have quite made my point. Perhaps I think there is more mechanization today than there really is. And that is the answer to my point. But I know that there are in use today, a number of small systems in the U.S. Patent Office. I believe that is the case with some of the foreign patent offices. Have there been, or should there not be, exchanges of these systems. Perhaps we are going to run into problems where a system designed for one patent operation will not work well in another, as might be the case with the concordance. Shouldn't we find this out now, by exchanging total systems, which may be nothing more than a matter of transferring punched cards?

Mr. Green: I think this is a useful thing to consider. Again, I would call to your attention that we are not talking about complete systems. We are talking about problems of patent classification this afternoon. I had hoped that we would limit our discussion to that. Of course, at the end of the three days something of this nature, I would imagine, would come forth.

Mr. Pfeffer: May I call Mr. Urbach's attention to the program for the morning of the third day, Wednesday, in which this information will be brought forward.

Mr. Green: Possibly we are getting to the point of diminishing returns. Unless there is any objection, shall we adjourn? I might say that you are to come together tomorrow morning here at nine o'clock. I have enjoyed the opportunity. Thank you.

The second session was adjourned at 5:30 p.m.

Third Session

Tuesday Morning, October 24, 1961

The third session was called to order at 9 o'clock by Mr. Harold Pfeffer, Office of Research and Development, U.S. Patent Office, Moderator.

Mr. Pfeffer: Our first speaker this morning is Dr. de Haan, the President of The Netherlands Patent Office. Dr. de Haan received his legal degree in 1924 from the University of Amsterdam. He graduated as an electrical engineer in 1930 from the Technical University of Delft. He became a patent lawyer, practicing at The Hague from 1932 until 1947. In 1947 he was appointed President of The Netherlands Patent Board and Director of the Netherlands Office for Industrial Property, and has served in that capacity ever since. He received an honorary Doctor of Law degree in 1946 from the University of Amsterdam. I am pleased to present Dr. de Haan, who will speak on a suggested interim solution to the patent examination problem. Dr. de Haan:

Dr. de Haan: Thank you very much, Mr. Pfeffer. I will make one observation here. You mentioned that I received an honorary degree in law. That, I am afraid is not so; I had to work for it.

Ladies and Gentlemen, I am very greatly honored to be invited to speak here about the modification of the Netherlands law, which is at present before our Parliament. I hope you will excuse me for having to improvise this speech as I learned only last week that I was to speak here. Due to the great hospitality of our American colleagues, I did not have the time to prepare a paper from which I could read. Besides, I am obliged to speak in a language that is not my own, which is always a bit difficult. I hope I shall come through. When I am not sufficiently clear, please be so kind as to interrupt me and ask me what I mean to say.

Coming now to our new proposal that tends to certain modifications of our present system, I think I can be most clear by explaining our present system of patent law first. I will go back somewhat in history and start by saying that our patent law was accepted in 1910 after very long preparation. This lasted, if I am right, from 1896 until 1900, when it passed Parliament. As a remarkable fact I should like to mention that this Netherlands patent law was drafted for the greater part by a highly respected committee of three people: a famous lawyer, a famous civil servant and an economist. These three people had no experience at all in the field of patents. They were very intelligent, highly intelligent as a matter of fact, but they never visited foreign patent offices existing at that time. They were guided by the existing patent laws of Germany, Great Britain and the U.S. They followed mostly the example of the German patent law. The fact that these men succeeded in drafting a law in such a form that until now it has completely satisfied everybody, is really remarkable, I think. This law was accepted by Parliament in 1910 after which the Patent Office was established. It started its activities in 1912, at the same time that the law entered into force.

During the time between the two wars the Patent Office also had the good fortune of having a President of great ability, a man who was a wonderful organizer and who built a machine so well that it could withstand even all the troubles of war. Mr. Alingh Prins, perhaps some of you remember him—he was the President of the Hague Conference of 1925—is still alive and is now 87. As you see, the patent business is a healthy business. During his time in the Patent Office Mr. Prins was fortunate enough to find the economic situation between the two World Wars such that we could get very good engineers. So before the last war the Patent Office was able to have as many young engineers as it liked and it could pick and choose among them. Thus the Patent Board started out with the most outstanding technicians who, much to my regret have now

reached an age where they will have to resign within the next years. One of the most outstanding of these brilliant technicians is my friend, Mr. Bulder, who is here amongst us. So, due to good law and a good staff, the Patent Office was able to handle the new practice of granting patents, according to the system of the law.

What is this system? It is the following: it is divided into two procedures. We have, first of all, the handling of patent applications by the Bureau of Industrial Property. And afterwards the handling of the application by the so-called Patent Board. These are two formally divided institutions. I myself, have the honor to be Director of the Bureau of Industrial Property, as well as being President of the Patent Board.

The Institute is solely an administrative body, whose duty it is to make the novelty search and the preliminary search of patent applications. The incoming application is handed to an examiner who looks to see whether it complies with the stipulations of the law. As you all know, the most important of these investigations is the novelty search. In general, the patent attorneys know the legal stipulations of the law, so usually they will not file an application which is against these stipulations. But, to our great regret, they do not know and cannot be acquainted with the prior art, so that we have to investigate what there is in the way of prior art.

The examiner of the Netherlands Patent Office works like his colleagues in other countries. He states the prior art and informs the applicant accordingly. The applicant has the right to refute his arguments. The applicant can file new claims, and only when the examiner is of the opinion that he has sufficiently searched the application, he sends it to the Patent Board, which consists of thirty members, of whom five are lawyers and the others, technicians.

The member of the Patent Board who receives the application studies the case. He considers whether he can agree with the advice of the examiner, and if that advice tends to a decision to lay the application open to public inspection, and the member of the Patent Board is in agreement with this, he informs the applicant accordingly. In many cases this will be done only after the applicant fulfills minor changes which the Board deems necessary, after which, without further procedure, if the applicant agrees, the application is laid open to public inspection.

But, if the Board is of the opinion that the application should not be laid open to public inspection, because the Board is of the opinion that the application lacks novelty or invention, then the applicant has the right to defend his application before the Board. If the defense of the applicant before the Board, which in this stage consists of only one member, does not succeed, and the decision is in the negative, he has the right to appeal to the Board of Appeal, which consists of three members, two technicians and one lawyer. After decision is made by the Board of Appeal the application is either laid open or definitely refused. Against the decision of the Board of Appeal, tending to non-granting of the patent, no appeal is possible. It is final.

After the application is laid open to public inspection, anybody can launch an opposition procedure during a period of four months time. This opposition procedure comes, in the first instance, before the Application Board, which in that case consists of three members, the member who has first decided to lay the application open to public inspection, another technical member, and a lawyer. After a decision is made the party who has not succeeded, has the right to launch an appeal which comes before a Board of Appeal also consisting of three members; in some complicated cases a Board consisting of five members may be nominated, the findings of which are the final decision of the Patent Office.

As you see, there are cases in which the same application may come before the Board four times, twice before the Board of Application and twice before the Board of Appeal. I think that this is an excellent procedure which guarantees the applicant, and third parties, that the applications are treated with the utmost care.

You will understand though that such a procedure requires much manpower, and we all know that at the present time manpower is very scarce. I am quite confident that the Netherlands Patent Office is not the only office in the world which suffers from a tremendous lack of staff. And through this lack of staff, we have experienced a tremendous arrear in our work for the past ten years. I believe there are at present about 40,000 applications in the Patent Office not yet disposed of, and the number of incoming applications is at the present moment about 14,000 annually, so on the average, we have an arrear of three years. This includes applications which are to follow the complicated procedure I outlined for you and which

may be in arrear of ten years from their priority date.

About five or six years ago, I advised the Minister that we could not continue this way, although at that time the arrears were much less than nowadays.

Our Minister appointed a Commission in which not only the civil servants, but also the patent lawyers, patent attorneys and representatives of the industry were represented. We have worked very hard in this Commission to find a solution. As you must have found yourselves, modification of law is not easy and it consumes a lot of time. Finally, after many modifications, we arrived at a project which has now been submitted to Parliament and which, as far as I know, has met with unanimous approval.

What is the underlying idea of this proposal? First of all, I should point out that the interested circles in The Netherlands were very keen on maintaining the system of the present law as I sketched it to you some moments ago. Although the system is very complicated and requires much labor, interested circles are happy with it. At first we thought that this might hamper any modification, but the work had to be done. After due reflection we found statistically that the average life of a granted patent is about five years. As you know in The Netherlands we have renewal fees, and though I do not wish to bring into the discussion the advantages or the disadvantages of renewal fees, one thing is undeniable, viz, that the obligation of paying renewal fees serves more or less the purpose of cleaning of the registers. I mean to say that if someone is no longer interested in his patent and he does not pay the renewal fees, the patent is automatically dropped. Consequently the average life of a patent is an indication of the interest which the applicant will have in his eventual patent. Those of you who attended the panels last week observed that one of the gentlemen present here spoke about the same question, saying that it is rather seriously doubted that all the work done by Patent Offices is justified since so many patents are of no economic value to their owners. He also mentioned the fact that in the United States the idea had come up to establish a comittee to judge the interest—the economic interest—of inventions first of all. I quite agree with the speaker of that day when he said that such a committee could not work. It is quite impossible to say before hand whether an invention will really have economic interest. All the same, if an inventor, who has made an invention which has, perhaps, not yet been worked out in all its details, but is a workable invention (as I said one that has utility and that is new), which he wishes to be patented, but he does not know whether it will be of any interest to his industry, he is obliged to file an application, especially in European countries where the priority date is not the date of the invention, but the date of application. In European countries patents are granted to the first applicants and not to the true and first inventors. So he must put in an application and only later will he be able to see whether the patent granted on his application is of any use to him.

Taking into account the fact that the average life of the patent is five years, we considered whether it would be possible for the applicants themselves to decide whether they wanted to have a patent immediately, or that they should wait with requesting the granting of a patent until they had more certainty about the economic value of their patent. This idea is the basis of our Bill. As you see, this Bill does not change anything fundamental in the existing procedure of the Patent Office; the change being merely that the applicant himself can decide whether the procedure, first the preliminary search and in the second instance the granting procedure, will be started. By this method we hope that our restricted manpower can be devoted solely to those applications which are of real interest, while those applications of which interest for the applicants is not certain can remain dormant until the moment interest becomes apparent or until they become dead files.

We have the following stipulations in our proposed Bill: If an application has been filed and the applicant requires nothing of us, we do nothing and the application remains dormant until the moment that the applicant asks us to proceed with the novelty search in order to make him acquainted with the prior art. After we have supplied him with the prior art, the application rests again and we hope that because of the prior art, the applicant will abandon his application. We do not hope so for the applicant, but for the furthering of our work. But if he thinks that the prior art we have supplied is such that there is a real chance for a patent, he will ask us for the granting of the patent. If seven years after the application date nobody has asked for either the novelty search or for the granting procedure, the application will be dropped automatically. We have tried to come to terms on a period

of years, somewhat longer than the average life of a patent in The Netherlands, hoping that in this way a number of non-important inventions—non-important from the economical point of view will die out. We have to keep in mind, as you have remarked yourselves that some technical, very simple inventions may turn out to be great successes, while otherwise technically remarkable inventions may be of no economic value.

The interested circles, especially in industry had one more objection, against the situation that was created by our extensive arrears. They said, "It is unbearable that we sometimes have to wait three, four or five years before the pending applications are ready to be laid open to public inspection. We do not know what we should do if we want to start on a certain manufacture; we do not know whether the Patent Office will grant a patent on another pending application which dated from the time before we started our manufacture, and which obliges us to stop our manufacture as otherwise it would infringe the afterwards granted patent."

So, we decided that all applications will be published eighteen months after their priority date. This way the industry is in a position to know which applications are pending, independent of the fact whether or not the search and the granting procedure have been requested by the applicant. As you will understand, if industry notices that an application has been filed and published, and possibility of conflict with a future patent is present and the applicant happens not to ask for the granting procedure, industry has a real interest in certainty and on starting the search and granting procedure on its own behalf. For that reason we have introduced into our project the possibility also for third parties to start the granting procedure as well as the novelty search. We do think that this way we have not interfered in any way with either the interests of the applicants or with the interests of third parties, while at the same time we have complied with the wish of interested circles not to alter the fundamentals of our present system of patent granting.

Mr. Moderator, I have mentioned the most important facets of our system of modification. If I have failed in any way my friend Bulder will correct me. Thank you.

Mr. Pfeffer: Thank you very much, Dr. de Haan. If we are to judge from Dr. de Haan's presentation, I would say that the hospitality on the part of the host is a very fine substitute for work on the part of the guest. Thank you again for a fine presentation. Now, are there any questions of Dr. de Haan?

Mr. Michel: Dr. de Haan, after the search and the granting procedure have been gone through, and you grant the patent, does the life of the patent date as it did before, from the date of filing?

Dr. de Haan: Mr. Michel, it did not date from the date of filing before. It dated eighteen years from the granting date. I forgot to say that there was also the objection of Industry that through the early years of a patent grant it usually became effective ten years after the filing date, and then still existed eighteen years from the granting date. So in our new system we have brought in the modification that the patent lives twenty years from the application date, or eighteen years from the granting date, which ever is most advantageous for the applicant.

Mr. Michel: Upon request by the applicant or by a third party for search and granting procedures, are there any additional fees required?

Dr. de Haan: There are. But I think that the fees required by the Patent Office will not be of great importance, and are quite justified, because the fees that the applicant has to pay to his patent attorney are much higher than the official fees of the Patent Office. You know, that is not a reproach against the patent attorneys, because they sometimes have to do quite a lot of work.

Mr. Michel: Where a third party is asking for the search, who pays the fees?

Dr. de Haan: The third party pays the starting fee, for starting the procedure.

Mr. Helgeland: If this system should work, let us say seven years, you might then have patent applications lying there, resting, for which nobody has asked for a search. You then get an application and you ask for a search. Do you tend, then, to search among the 40,000 resting patent applications, to determine whether there is an older filing date or older application colliding (Interfering, Ed.) with the application for which a granting procedures is now asked? And, I suppose that all applications, whether they ask for granting procedure or not are to be classified and divided among the examiners, and are lying there and every seven years, the examiner takes away the lowest. Shall the examiner now, if he gets an application asking

for granting procedure search in this file to see whether there is an older patent application colliding more or less with it, and who shall pay? If he finds for instance ten such applications shall he start examination of these ten applications and who shall pay for that?

Dr. de Haan: That is really a difficult question. But I think we can start the examination because our whole procedure requires that we must have laid the application open to public inspection and then it is up to the man who has an older right to make opposition. And do not forget, we had the publication of the application, so the examiner can, under the older applications, look for colliding applications and inform the applicant, during the search, that there is a colliding application.

Mr. Helgeland: But if the owner of the older application does not do anything about that, does he lose his right?

Dr. de Haan: No. Because the older man whose application is published is the first applicant. So as far as the second application collides with the first application, he has not the right to a patent. So our searcher must do a search among the prior art until the filing date, and among the published Netherlands applications, also until the filing date. He can state that there is a prior application.

Mr. Helgeland: But does the examiner have an obligation to search among his files of resting applications?

Mr. Bulder: But they are published. They are in the pigeonholes. All published material is taken into consideration when we search for novelty. But, nevertheless, we are obliged to search for it and to cite it.

Dr. de Haan: As far as they are not published, certainly he must look in his files. But we already have in our Classification Division a certain system to trace colliding applications. I will not say that it works perfectly, but we can generally tell, although it is now much more difficult with our arrears which are not published to trace colliding applications than it would be under the new system.

Mr. Michel: In that case, the onus is not exactly on the searcher or on the Patent Office if during the search on an application the searcher or the office, finds that there is present in the office an application for the same invention having been filed prior to the one he is searching. He can refuse the later one on that prior one provided it has been published.

Mr. Bulder: Yes, certainly he can. And if he waits six months it is always published.

Mr. Jeffery: When you say that the specification is laid open to public inspection, does that mean that, in law, it is said to be published. We have in Austrailia a procedure of saying that a thing is open to public inspection by just publishing the number in the Journal. Is it like that, or it is a publication, a printing?

Dr. de Haan: It is not in the law, but it will be in the rules. That is a difficulty. We now have in this system two kinds of publishing. First of all, eighteen months after priority date we publish it as it was filed, and if the granting procedure has been asked, we publish it again in the way in which we are prepared to grant the patent.

Mr. Jeffery: Since you have made a first publication, does not this put a restriction on the right of the applicant to amend and alter it?

Dr. de Haan: Formally not. Practically perhaps. Because it very often happens that we state afterwards that the applicant has succeeded in introducing new subject matter into the application, which under the law is forbidden. If we have made such a mistake we now have the help of opponents who will tell us that such and such a thing was not in the original application. So it helps us to comply more with the law than perhaps we do at the present moment. I will not say that it is easier, but it may happen that it can now be controlled by everybody.

Mr. Michel: In the case of an application being filed in the Office originally, naturally, as I understand it, it would have to have claims. What happens if the applicant claims several inventions in that application?

Dr. de Haan: At the moment of filing nothing happens. But at the moment of searching, when it is not before the Patent Board, but in the Office, we can say that more than one invention is being claimed and that the application will be divided. This has been the subject of a lengthy discussion in our Commission because, not without reasons, the patent attorneys argued that the Administration and not the Board should have the right to make the decision. We have found the following solution. The Administration, the Institute of Industrial

Property can say that there are several inventions in the application, and they have to file a second application. But, if later on when the granting procedure is started and the Board thinks that it was an unjust decision, he gets back his fees. On these terms we have come to an agreement with the interested circles.

Mr. Michel: Where there are several inventions claimed under one application, and a third party decides that he wants a search made to find out whether his manufacturing of one of such inventions might infringe a subsequent patent, has the applicant the onus to ask for a search and abide by the divisional requirements of the Office and carry on the examination on all the inventions that he has claimed?

Dr. de Haan: The third party pays the fees for the search.

Mr. Michel: Yes, but he may be interested in only one invention being claimed there, so he would pay the fee for that part for which he is interested?

Dr. de Haan: Yes.

Mr. Michel: But the rest is not being searched?

Dr. de Haan: No.

Mr. Helgeland: What do you do with the applications for which granting procedure has not been requested? Are they tested only for the formalities? Are they treated almost like the treatment of patent applications in registering countries?

Dr. de Haan: Yes. The only thing we look for is that they comply with the formal stipulations of law and rules: that there is a specification, that there are claims, that the filing fee is paid, that there are so many samples of specifications, and claims, and so on. But if an application, and this is also true in our existing system, does not comply with the formal prescriptions of the law, we do not consider it an application at all. That is only a sheet of paper.

Mr. Helgeland: Isn't it possible then that the system would throw the gates wide open for misuse, in that vague and broad applications would be filed and probably, as I understand, for a minor fee only? Isn't there a danger that industry, the applicants, being so minded, could fill up your file of resting applications with vague and obscure patent applications, in order that they may have the possibility of picking out of their file anything to object against if anything comes up during seven years?

Dr. de Haan: We have considered this matter. You understand that if you have a lot of obscure applications filed, which may be possible, it is especially in the interest of the Industry to see that it does not happen. So we had in our original project a stipulation, that if such un-understandable applications were to be filed, the Patent Office would have the right to initiate the searching, and have the fees paid by the applicant, for the reason that the application is un-understandable. But the Industry was against such a stipulation and it is especially because of the interest of Industry that it is not there. We complied and dropped the stipulation. So I think the danger is not so great if the interested circles do not feel it.

Mr. Helgeland: It is just the interest of the Industry that I might fear.

Dr. de Haan: The applicants might have an interest, but the serious industries have no interest at all in filing such applications and for that reason, third parties can always ask for the granting procedure.

Mr. Pfeffer: Dr. de Haan, may I ask what sort of general reaction have you had from the public on this procedure?

Dr. de Haan: Well, we discussed this whole matter for a long time with all the interested circles we could trace, and until now it seems to me that we have had, in all, general approval. So we hope that it will pass through Parliament without much opposition. But you can never predict what will happen in Parliament.

Mr. Michel: With this system, did I understand you to say that the average life of a patent was about five years with renewal fees? What is the percentage of time devoted to search that you hope to save? Do you expect to make only about half the searches that you were making before, or less or more? Of course, you have not tried it. This is just a guess.

Dr. de Haan: I must say that it is absolutely uncertain if this system will be a success. There are people who say, "You will save only five per cent" and there are people who say "You will save fifty percent." It depends completely on the applicants. If all applicants are keen to get their patent immediately, the system will be of no use at all. But as far as our greater Industry goes, they say they will certainly make use of this system to a great extent, because they really have many applications that they do not know what to do with at the moment of filing.

Mr. Michel: Yes, there are a great many applications filed in Europe I notice, and probably in every one of our patent offices, as safety measures. They do not know if they are even sure that they will ever use it, but they file an application just to make sure that they come in first to prevent others getting a patent, blocking the field.

Mr. Rotkin: I understood you to say that the applications are handled by various examiners on a classification basis. Are they assigned to particular experts or specialists in the area?

Dr. de Haan: Yes.

Mr. Rotkin: To what extent, in your Office, are the examiners free to exchange their workload. By that I mean, that if after initially examining an application he determines that someone else is more expert in that area, can he freely transfer the application.

Dr. de Haan: The direction of the application is a form. It goes to the Classification Division. The Classification Division writes on—it is not exactly so, but I would go into too much detail to say it otherwise—the application a Division. We have thirty divisions. And then the examiners in the Division decide who will take the application. Or they may say it is not for our Division. It should go to another Division. In all these classification questions, the Chief of Classification, who is Mr. Koelwijn has the final decision. But it is very, very exceptional that the examiners do not come to an agreement among themselves as to who will take the application.

Mr. Pfeffer: I realize there is a good deal of curiosity about the different procedures, but I think for the sake of the time element, we should confine ourselves to the particular question at hand.

Mr. Reznek: Who are these third parties? Can they be the assignee of the application? That is, if a man has an interest in an application and wants the patent to be issued, can he act as a third party? Can he pay the fees?

Dr. de Haan: Anybody can act as a third party. It is open to everyone to ask for the granting procedure.

Mr. Kalikow: Can you say whether or not there is any serious consideration for using the Netherlands system of such plan as the basis for Common Market patents?

Dr. de Haan: I think that it still has to be worked out, but I think the idea of the Common Market is that you have automatic novelty search and the delayed granting procedure. In our proposition, project of law, there is the choice for both instances, but I think in the Common Market they are more inclined to have an automatic search and a delayed granting.

Mr. Pfeffer: Any other questions?

Thank you, again Dr. de Haan, for an interesting morning. I would like to suggest that we adjourn proceedings now for a coffee break.

The third session adjourned at 10:30 a.m.

Fourth Session

Tuesday Morning, October 24, 1961

The fourth session was called to order at 10:45 A.M. with Dr. Watson Davis, Director, Science Service, Moderator.

Mr. Pfeffer: We will begin our fourth session this morning on Problems in Abstracting and Analysis, and your Moderator for this morning is Dr. Watson Davis. Dr. Davis is very well known amongst most of us here and needs very little introduction. I think most of you will know him as the Editor and Director of Science Service, with which he has been connected since 1921. Dr. Davis is a civil engineer by profession, and has an honorary doctor of science degree from George Washington University. He is also a Past President of the American Documentation Institute, and he has done much to help develop the use of microfilm as a means of distributing scientific information. I would like to present to you Dr. Watson Davis.

Dr. Davis: Doing this job gives me great pleasure, especially since I can turn to Mr. Pfeffer and ask him what I should do. It seems to me that what you people are discussing here this morning is of far greater importance than these 9 million patents that have been granted, and the influx of a good many more thousands of applications a year, because the problems you are facing are a concrete embodiment of the great problem which we have before us of marshalling the world's scientific and technical knowledge.

I rather feel that because of the urgency of industry and inventors and other people that are interested in patents, perhaps you can get at some of those problems a little faster than some of the quieter, perhaps even more basic fields of science and technology. So, in a sense, you people are sort of running interference for the other people in the fields in spite of the great achievements that have been made in abstracting and the analysis of documents in the other fields which are not directly related to patents.

So I am going to have a lot of fun listening to you people and learning a lot, and it ought to be quite as entertaining to me as it is to you. Our first paper this morning is by the Honorable Cecil N. Jeffrey. He is Supervising Examiner in charge of classification and machine searching in the Australian Patent Office. He is, incidentally, the editor of Volume I, Number I of the Australian Patent Society Journal. He has a graduate science degree from the University of Sydney. Cecil N. Jeffery will talk to us on "Encoding and Abstracting for Universal Use." Mr. Jeffery.

Mr. Jeffery: Thank you Mr. Moderator, ladies and gentlemen. I am afraid that the title of my address was chosen in rather a hurry; as a matter of fact I am going to talk mainly about abstracting, and a little about patent specifications and encoding for mechanical searching.

Yesterday we discussed the subject of international cooperation through an international classification or a concordance of classifications. I am not sure that we reached any firm conclusion except that it is going to be a long and difficult job to develop a truly international classification or concordance.

However, I think there are a few simpler steps we could take almost at once, to minimize the amount of repetition that occurs, particularly in those patent offices which receive and file specifications from abroad.

Let me pose a common situation. Assume we are in patent office B and we have just received a large batch of specifications from patent office A. The classification staff at B now have to incorporate these into the search files in the right place, as quickly as possible and with a minimum of effort.

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Let us also assume that offices A and B do not adopt a common classification and there is no concordance between their separate domestic classifications.

Obviously someone at office B has to read the specifications as thoroughly as possible within a limited time. Yet this has been done already, of course, by a person at the originating office A. Our problem is really this—to devise means whereby A can communicate to B enough information to enable the latter to correctly classify a specification without having to completely read it.

I would suggest that there is a combination of measures that could be adopted:

In the first place, an official at A has selected a title to be printed on the first page. This title can be very informative, e.g. "Improvements in can openers of the triangular punch type", "Preparation of chemical X from chemical Y." Unfortunately, too often the title is: "A new chemical compound" or "Improvements in electron discharge devices." While there may be some excuse for an applicant wanting to conceal his invention behind a vague title while the application is pending, there seems no justification for not adopting an informative title when the patent is issued and public. Where, as in my country the law prescribes that the title shall describe the invention, the law should be strictly enforced or alternatively, the office could be empowered to construct the title.

My second suggestion is that, since the classifier or examiner at office A has been obliged to thoroughly analyze the specification, he is in the best position to compose an abstract and have this printed on the front page of the specification. Now there are many types of abstracts and I would particularly like to draw your attention to one known as the key word abstract. This form of abstract has been adopted by the Standards Committee of the American Institute of Chemical Engineers and is described in the journal "Chemical Engineering Progress," issues of May and June 1961, which I have here.

In this procedure, the most important papers are accompanied by a conventional language abstract and also by a list of key words selected from a standard thesaurus. In addition, the key words are often followed by letters indicating the roles of the corresponding parts, chemicals, etc., represented by the key word. Where a paper describes more than one topic the key words of each topic are grouped or "linked" together. Where a key word is specific it is also accompanied by the more generic term obtained from the thesaurus.

If such an abstract could be printed on the specification it would enable the officer at receiving office B to encode the abstract into any type of mechanized system using concept coordination with wide or narrow terms to suit the desired depth of analysis. Even for classification guidance, a list of keywords can be quite informative.

My third suggestion, which may be more difficult to implement but is worth consideration, is that an international number should be allotted to an invention, in addition to the domestic serial number. This would assist in filing specifications of the same invention received from a number of different countries.

My final submission, for which I am indebted to Mr. Robert L. Birch of the Scientific Library here, is perhaps more related to the work of a librarian, but may be of use to classification officers. The proposal is that we should agree to have on the front page of the specification, standard locations for the various particulars of the application and patent. For example, at the top of the page would be placed the patent number and underneath this the application number. The topmost of a list of names would be that of the inventor and next one that of the patentee. Dates could be similarly arranged in standard order with possibly the priority first, application next and so on. Filing and retrieval of specifications, printed in languages unknown to the officer, would be much simplified.

I hope that this does not sound too presumptuous coming from the representative of a patent office which does not normally search through foreign specifications. It is more provocative than informative, but I hope it will help to point the way to fuller cooperation among our various offices.

(In preparing this talk for publication, I would like to draw particular attention to the paper subsequently presented by Mr. M. Wolk. The proposal to design the drawings as an abstract is very pertinent and deserves close consideration. In fact the whole question of the form and content of the published specification is due for reconsideration. Although the main function of the specification is to set out a defined monopoly it is also a piece of information and as such, has to compete for attention with other forms of information. It should, like all information, be prepared in such a manner

that it can be entered quickly and reliably retrieved from storage in any of the available filing systems. C.N.J.)

Dr. Davis: Thank you very much, Mr. Jeffery. Just to start things going, I think for titling inventions you had better get some help from headline writers in newspapers. They have to put the story in the headline. Is there discussion?

Mr. O'Day: I have a question on the key word abstracting. When you have patents in (1) areas where you have large variable structures that contain literally thousands of individual specific compounds, and, (2) patents that contain columns of specific compounds, do you have any rules to apply to the key word abstracting that would allow for consistency and conformity in the abstracting, or is it strictly up to the abstractor, and do you have as many applications as you have people doing the abstracting?

Mr. Jeffery: Well, sir, I am in the happy position of not being a chemist and therefore I cannot really answer the question. But I would not like to go into too much detail. I refer you to this journal and the work of the American Institute of Chemical Engineers. I can see that there would be quite a lot of work in some offices, but the work would be shared and it is work that only has to be done once in one office. I think that that is the main feature of it, so I do not really care how long it takes or how detailed it might have to be.

(In response to a question by Mr. Lawlor, it was brought out that the thesaurus employed was the one developed at DuPont and had about 50,000 key words. Mrs. Swanson commented that it would be desirable for examiners to have, on the American patent, a reference to the corresponding foreign patent number.)

Mrs. Swanson: Sir: you said that perhaps there might not be a necessity for having many key words in a key word abstract. Why?

Mr. Jeffery: Well, if the receiving office is an office which only classifies, it only needs enough information to put it in the right class. If it is an office that encodes its specification on punched cards and so on, of course, it needs a lot of key words. I say it may be necessary only to have a few key words, because I think most patent offices, for most of the specifications they receive, would only be interested in a very broad set of descriptors to assist in classifying. The whole principle here is for the sending office to tell the receiving office just enough information to enable the receiving office to classify documents.

Mr. Jancin: I am afraid that I do not fully appreciate or understand the significance of the international identity numbering system. Would you explain that a little further please?

Mr. Jeffery: Receiving office B would receive two specifications from different countries. It may appear that those specifications deal with the same invention. They are from the same applicant and they are about the same invention. But that is not immediately apparent to receiving office B without having to read through both and compare them. But I have suggested, in addition to the various application numbers, and patent numbers that appear on each specification, the use of a number which has been allotted from a central bank of numbers. If that number is the same on two specifications from different countries, that means that they describe the same invention.

Mr. Rubach: To some extent, I think what you would like to have done is already done by the International Classification system. We have found it is now very easy to bring the specification to the right man because every contracting Patent Office is compelled to print on the specification the class of the International Classification system, used in multiple classification. There you have the opportunity to bring a lot of items in, just at the top of the specification. Yesterday I pointed out, we not only place symbols at the top of the specification, which identify the invention, but we additionally print symbols in lighter type which tell you of matter which may be regarded as important, but does not form part of the invention. And I think doing so, we in Europe have already taken the first step in this direction. It would be very nice if we could go further and bring the U.S. Patent Office to the same procedure, but I am afraid it will be a little bit difficult after the discussion we had yesterday.

Mr. Knight: We have, as most of you know, written and published abridgements of specifications for many years. Does Mr. Jeffery or anyone else consider that it would be of any great advantage to print those abridgements on the opening page of the specification, rather than as a separate publication?

Mr. Jeffery: Well, yes, Mr. Knight. The examiners' files in the Australian Patent Office are prepared by cutting the printed abstract out of the

journal and pasting it on the front of the printed specification. It is of great use to the searchers and I am sure it would be of great use to other offices to have some sort of abstract or abridgement printed on the specification.

Mr. Birch: I wonder if any thought has been given in the Common Market countries to the publication of a Common Patent Office Gazette—that is, a combination of the various gazettes of those countries into one? Would that be useful?

Dr. de Haan: Mr. Chairman, I might say that up to now this question has not been raised in the Common Market as being too detailed. But I am pretty sure if, in the future, a Common Patent will be granted, there will be also a Common Patent Journal.

Mr. Andrews: Mr. Jeffery has mentioned the fact that there is a language and a key word type of abstract. I would like to offer a suggestion of something that is intermediate between these two and will not afford the criticisms from the various patent offices that a thesaurus associated with a key word index might engender. I am referring merely to a selected extract of terms that each patent office considers important in its own patents. No attempt is made to fit it into an existing thesaurus, but merely to make a selective extract of important key words and phrases in the patent. This would be unique for each particular patent. It would require that someone later organize the entire vocabulary into a standardized one if that is necessary. But I feel that this may overcome some of the difficulties of all the patent office getting together and agreeing on a thesaurus.

I might add that Mr. Rubach did propose this key word for all the patents in a meeting we had two years ago, and I believe that he has been very vigorous in his attempts to further this action.

Dr. Davis: Thank you very much. If there is no further discussion on this at the present time, we will have the next paper, "Abstracting of Patents," by the Honorable Kotaro Otani, a Chief Examiner of the Japanese Patent Office. Mr. Otani is a mechanical engineer. He has been Chief Examiner for a year, and trial examiner before that. We are glad to have you here, sir.

Mr. Otani: Thank you, Mr. Moderator, ladies and gentlemen. I am very happy to have an opportunity for reporting the circumstances of the examination literature in the Japanese Patent Office. As you know, the literature arrangement is most important for patent examination. And I would like to explain the projects that have been taken for the past several years in the Japanese Patent Office, and the projects that will be taken in the near future, particularly in regard to the preparation of abstracts of patents and other technical literature.

In Japan the number of patent applications including utility models has been increasing year by year, and we received over 100,000 new applications last year. I just now used the term "utility models". I think you are not quite so familiar with this term because only a few countries in the world have this system. But you may understand that a utility model is, so to speak, a small scale invention and is different from a design.

Now, returning to the main subject, the number of disposals for patents and utility models in our patent office is about 100,000 per year, while we have over 200,000 pending applications now. This means that we have pending applications about twice the number of disposal capacity per year.

In order to dispose of such a large number of accumulations, we are making every effort we can. The important projects which have been taken or will be taken in the Japanese Patent Office for the literature arrangement are as follows:

The first project is the subdivision of patent classification. The present Table of Japanese Patent Classification was prepared in 1948 and the Table was revised this year. As a result, the number of subdivisions of classification has been increased in special fields including nuclear engineering, and further, the number of subdivisions in other fields will be increased in the future.

The second project is the preparation of abstracts about patents and other technical literature. In patent searching we usually use specifications of Japanese patents including utility models and patents of foreign countries, technical journals of Japan and from several foreign countries, etc.

In particular, we use as most convenient examination materials, abridgements of British patents, Official gazettes of United States patents, Auszuge aus den Patentanweldungen and the like, beside Japanese patent specifications and utility model specifications. Also, we have other convenient examination materials, such as Chemical Abstracts, Science Abstracts, Nuclear Science Abstracts, Chemisches Zentralblatt and abstracts by Japanese Information Center on Science and Technology.

They are very useful to increase the efficiency of patent examination.

Beside these abstracts, we have been making for a few years our own abstract cards from technical journals of the United States and several other countries in the following technical fields and use them for examination purposes only. The above mentioned fields are nuclear engineering, recently developed materials, polymer chemistry, petroleum chemistry, electronics, and machine tools.

These cards are kept by the examiners in accordance with the Japanese Patent Classification. The number of cards already prepared is about 14,000, and about 6,000 cards are being prepared yearly.

These cards are serving very efficiently for patent examination. We are now trying to extend the range of abstracting to foreign patent specifications. And as to these foreign patent specifications, we would like to choose the specifications of the United States and Belgian patents next year. For this purpose we have requested a budget of about 73 million Japanese yen (this corresponds to $200,000) for making the abstract cards for about 65,000 foreign patent specifications, including 50,000 United States patents and 15,000 Belgian patents. Here we have selected Belgian patents because in Belgium the time from filing to publication is very short, and therefore, we can know the newest techniques through the Belgian patents. And we would like to extend this plan to German and French patents in the future.

As I mentioned before, abstract cards are now used for examination purposes only, but we are also planning to permit the public to use them. I think, if they became available to the public they will contribute to prior searching by applicants and to obtain technical information.

As I mentioned, we are using many abstracts, but among them British abridgements are most excellent and are utilized most frequently. The Official gazettes of United States patents and Auszuge aus den Patentanweldung disclose only a claim or claims and the description of claims only is rather difficult to understand. Therefore, we consider that if abstracts of patents would be made and published in the other countries besides Great Britain, they will be utilized efficiently in the world, for examination literature as well as for technical information. Furthermore, if even in the countries in which English is not spoken or not used, English translated abstracts could be made and published of their own patents, the value of abstracts would be greatly enlarged. Therefore, I hope that the problem of patent abstracting will be considered on an international scale. Thank you.

Dr. Davis: Thank you very much, Mr. Otani. Discussion, please.

Mr. Purdy: Mr. Otani, you mentioned a Japanese abstracting center, I believe. Is this a governmental function?

*Mr. Kitagawa:** No. It is a private organization.

Mr. Otani: It is between a government and private organization.

Mr. Kitagawa: May I amplify that for you? This is called in translation, "The Japan Information Center for Science and Technology." It is quasi governmental, and up until now its budgeting has been divided between government and private industry. They have been publishing abstracts of foreign patents as one of their functions. I believe they also have an abstracting and translating facility available to anybody outside of Japan.

Mr. Rotkin: To what extent does the face of the Japanese patent bear information in other than Japanese print? And do you contemplate any change in that? I am thinking in line with Mr. Jeffery's talk of the advisability in the immediate future of having additional information on the face of the patent to help the other patent offices in placement of the particular patent in their appropriate classification files.

Mr. Kitagawa: The first question that you ask is what does the face of a Japanese patent contain. Is that correct?

Mr. Rotkin: At the moment, and what is contemplated.

Mr. Otani: What do you mean by the face of the patent?

Mr. Rotkin: The heading.

Mr. Otani: We have planned to express the heading of the subject in English, but this plan is not exactly confined now. It is only a plan.

Mr. Kitagawa: I sort of jumped the gun on your question. Getting back to question one. The face is quite similar, information-wise to the U.S. Gazette.

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*(Mr. Kitagawa, from the Office of Scientific Information Service of the National Science Foundation was kind enough to volunteer his services to Mr. Otani, as interpreter.)

Mr. Rotkin: Is it entirely in Japanese print or is it also in the Latin?

Mr. Kitagawa: Unfortunately, it is entirely in Japanese.

Mr. Otani: We would like to consider a plan to express it in English in the near future.

Mrs. Swanson: $200,000 was cited as the cost, but I did not get clear what the cost was for.

Mr. Kitagawa: Rowena, this was for the purpose of covering foreign patent literature and abstracts.

Mr. Otani: It is the cost for making abstract cards for 50,000 United States patents and 15,000 Belgian patents.

Dr. Davis: Is there other discussion? Otherwise, we will get on with our program. Thank you very much.

From the standpoint of fitting in time, we are going to switch two papers. We are now going to hear the first paper that is listed on your program this afternoon and Mr. Wolk's paper will be heard this afternoon. The Honorable Tore Oredsson, Bureau Director of the Swedish Patent Office, is going to talk to us on some thoughts on automatic indexing and encoding. He is a Master of Science in chemistry from the Technical University of Stockholm, chief examiner, and he has the special duty of presenting cases in Supreme Administrative court. Mr. Oredsson.

Mr. Oredsson: Thank you, Mr. Moderator, ladies and gentlemen. Our main problem is how to select out of a given collection of documents those documents that are relevant to a given topic. The advent of punched card equipment and electronic digital computers has encouraged speculation on the possibility of establishing an automatic data—or reference-providing information system that would respond to a request for data or references with an answer providing pertinent data or references, all this in an entirely automatic fashion and with great speed.

The only practical solution for a reference-providing system is to assign to each document a clue or a set of clues, and to assign likewise to each topic a set of topic terms in such a way that by comparing the set of topic terms with the set of clues, a decision as to the relevance of the documents can be reached. How this assignment of clues should be done is a great problem. If manually, it will take a long time and many people. In my opinion we have to try seriously all means by which to obtain these clues from the documents by some mechanical procedure.

Experiments with automatic indexing and encoding have been made by organizations, carrying on research in the storing and retrieval of information. In an electronic computer, a comparative statistical analysis has been made of the frequency of word and concept in certain scientific and technical articles. The frequency established in the course of that analysis was either the absolute frequency of a word in a given document or the ratio of the relative frequency of the word in the document to its relative frequency in the language in general. The significance of high frequency words and concepts for the identification and encoding of such articles has afterwards been estimated.

The methods used and the results obtained thereby have been criticized. Among others, Professor Yehoshua Bar-Hillel, Jerusalem, put forward criticism in a very interesting and constructive paper called "Some Theoretical Aspects of the Mechanization of Literature Searching." I am going to rely to a great extent on his paper. Criticism is desirable and necessary since it gives incentive for improvement of the methods used. However, you may think that to some extent the criticism has gone too far. It has been shown that there are deficiencies in the new methods, and these have been found so serious that the methods have been considered useless. However, one seems to have forgotten that the present methods for information retrievel are also very defective.

Although a large amount of work is being laid down on conventional classification systems, such as the American and International Classification system, these systems are still imperfect. The classification of new search material—for instance, new patents—according to a conventional classification system may be very difficult, and this is especially true if the system is very subdivided. Different results may be obtained depending on the person who is classifying. Furthermore, it is sometimes difficult to know which class, sub-class, etc., has to be searched. The most important one may be overlooked. Finally, the examiners may have very different points of view as to the relevance of a certain document. A document, which examiner A considers to be a reference, may be completely ignored by examiner B.

Let us, therefore, set our aim on a practical target, and be satisfied with a system that just works more satisfactorily than the existing ones on the average for a given group of users—namely, the examiners.

In my opinion, there is no reason a priori to disqualify a search material or procedure constructed by automatic indexing and encoding. On the contrary, one should find out which are the problems in automatic indexing and subsequent searching by means of stored indexes obtained through automatic indexing. Then one should analyze and evaluate those problems as thoroughly as possible. What is ultimately decisive is how the reference list thus obtained will appear as compared with those obtained by competent humans with regard to *quality* and *cost*.

I would like to emphasize at this point that I have had no possibility of making any practical experiments. All I have done is to read certain literature in this field. Against that background I would like to try to give you some of the problems. To start with, I will disregard the difficulties due to the fact that different languages are used. Furthermore, I assume that the machine can be supplied at no or very little extra cost with a machine searchable version of the original text. The sequence in which I mention the problems is perfectly arbitrary and of no importance.

1. The first point would be the problems of synonyms, comprising also all the phrases of the same meaning as the individual words. As examples of synonyms, we could take the concepts "distillation", "rectification", "evaporation"—and as an example of a synonym phrase, that "a liquor is distilled or vaporized." This problem is well known; to cope with it, it has been suggested that a synonym dictionary be used—for instance, Roget's Thesaurus. In a subcommittee for documentation appointed by the German Association for Documentation so-called concept-lists are being established in different technical fields, if I am rightly informed. Also, in the Australian Patent Office there have been developed "descriptors" of the same kind. And I believe that, for instance, ASTIA has something of the same sort. Combining the material thus already established with the material obtained by the frequency analysis which I mentioned in the beginning, a valuable material with which to start the creation of a thesaurus of the kind I have in mind may be at hand. Such a dictionary would be of help in the reformation of the original topic when a literature search based on the original formulation did not yield satisfactory results. I shall be coming back to this presently.

It might also be of use for the authors of new articles and patent specifications. Perhaps it would contribute to the forming of an internationally standardized technical and scientific language, which, in its turn, would simplify the coding.

The dictionary should be arranged alphabetically by term, as well as numerically by code. All the synonyms should be collected under one code number in the numerical list, but each one should be found in its alphabetical place in the alphabetical list.

I have been asking myself, if it might perhaps be of advantage if the terms could be grouped together—for example, under the following headings: Terms pertaining to construction, to function, to use, to manufacture and fabrication, and to technical characteristics. Which group to use will depend on the technical field in question, and the manner in which, according to experience, the examiner will proceed in searching that field. Such grouping should, to my way of seeing it, facilitate the subsequent information retrieval. Of course, there are many points of doubt about a grouping of this kind. I just mention it to see if perhaps we might learn something by discussing it.

2. The second point would be the problem of homonyms—that is, when one and the same word has several different meanings. Take, for instance, the word spring, which may be the metal spiral supporting the chair you are sitting in or the season of cherry blossoms or even a fountain, and a good many other things as well. Certain languages have very many homonyms, and this makes for difficulty, but the difficulties should not be exaggerated; within limited technical fields, you will get homonyms only to a limited extent.

3. The third point would be the problem of negatives and of low frequency concepts of importance for the identification of documents. Even if you do not take any special measures to master this problem, the quality of results you would get in retrieving information would, in practice, not be appreciably reduced thereby.

4. The fourth point would be the problem of different forms of one and the same concept—for instance, difference, different, differently, differentiate, differential. Insofar as they are synonyms, the problem is already mentioned in the foregoing. And

to the extent that the meaning is dependent on the context, the problem belongs rather to the point which I am just about to talk of—that's the fifth.

5. Thus, the fifth point would be the problem of dependence of words or concepts on the foregoing and subsequent concepts—that is, the context. "A nuclear reactor", thus, is something altogether different from the words "a reactor nucleus" at least in the Swedish language. "The cooling of water" is not the same as "cooling with water", etc. This is a problem of syntax, analogous with the problem you would encounter in machine translation. When responding to a certain inquiry, all indexing systems would, for this reason, produce a number of references of no relevance to the inquiry, so-called false drops. However, this fact is not a cause for any special worry, if the number of false drops does not become too large. One solution might be to consider word pairs or, in some cases, phrases. Methods for encoding relationships in context by expanding the codes of these index terms to contain syntactic "role indicators", "interfixes", etc., have been proposed by, among others, the U.S. Patent Office group. These methods make the coding, the retrieval operations and the rephrasing of the search question in preparation for the retrieval, more complex. The only way to prove, if it is necessary to encode relationships, is to make comparative tests without as well as with such interfixings.

6. The sixth point would be the problem of superior and subordinate concepts, and of concepts or combinations of concepts that partly cover one another or overlap. If you want to know, for instance, what is known about methods for exterminating insects with chlorinated hydrocarbons, a paper on extermination of flies with DDT would be of interest. This problem was stated in the introduction to the papers published in the area 6 of the International Conference on Scientific Information, 1958, here in Washington, in the following way: "Concept of relatedness or connectivity of documents in a collection, along with a suitable metric to define the degree of relatedness." Up to now, nobody seems to have solved this problem satisfactorily, even though certain theories have been brought forward.

7. From this I wish to run over to another difficult problem, the problem of references that are relevant even if they are not deadly citations; for a document is not necessarily either relevant to a given research topic or irrelevant to it—it is rather the degree of the document's relevance which is important. This last problem is nothing special for mechanized searching. As I mentioned earlier, the same problem exists in manual searching. It is, however, a real problem with which we have to cope.

In summary, we can notice several problems in mechanized indexing and encoding and in mechanized searching of files prepared in this way. The most difficult of these are, in my opinion, first the problem with generic and subgeneric concepts and concepts or combination of concepts which partly cover one another, and secondly, the problem of relevance. I would like to find out if the solution to these problems might be *not* to use the computer in the way it is now generally used. When a computer is now used for computing, it is best for economical reasons to program the solution of a problem and to have the computer work on it without any human intervention until the final solution is pointed out. However, the best way to make use of an electronic computer for information retrieval might be, as Professor Bar-Hillel suggests, some kind of *intermittent employment*. The decision as to the changes to be made in the original set of topic terms in order to get additional references, should not be left to the computer. Whether a new search should be conducted on an index obtained from the original one by omitting one of the topic terms by substituting for one of the topic terms some other term, or whether the request is to be rephrased altogether, all that is probably best decided upon by the examiner.

The statistical analysis of the word and concept frequency, which I have already mentioned, should, as I see it, be riveted on the specification as a whole and not merely on the claims. By doing so, one would find out if an indexing of the claims only would, in certain cases, be sufficient. This would be the case particularly with regard to patents from countries that require a certain conformity between description and claims.

The analysis should be directed to fields where similar work has been or is being undertaken in different countries. As an example of a field, which is thus the subject of an intensive study in many places, I might mention the technology of atomic energy. In the German Committee for Documentation, there is at present being put together a concept list relating to atomic reactor technique. In CETIS, an organization within the EURATOM, work is right now being conducted with a view to the setting up of a list of "descriptors" in this field.

Perhaps lastly, the Australian and British Patent Offices may have access to lists of "descriptors" and practical experience as to Permutation indexing in the field of atomic energy.

Dr. Davis: Thank you very much Mr. Oredsson. Is there any Discussion?

Mr. Fairthorne: So many very important questions have been raised here, in fact all of the important questions I think people have been trying to solve for some fifteen years, that one deserves comment on all of it. We have had a very good summary, from what I have heard. One thing I want, however, to suggest to anybody who is dealing with some of these methods, roughly speaking the first time, is not to consider whether they work. As a matter of fact, they do, mainly because group-fact language does work, which is a fact you might overlook if you have read Dr. Bar-Hillel's paper. You are surprised if you understand any words at all by the time you have got through. But my opinion about Dr. Bar-Hillel's paper has been expressed at length over there.

You see, if you take the question of statistical analysis of the text, which, by the way, runs right back, and I would like to give the name of the person who really did the first work on it in modern times, which was Dr. Richens, of Cambridge, England, I suppose I shall have to say, right back at the end of the war. I believe it is hampered solely, of course, as most people have a lack of equipment for this very, very difficult task. You must use the entire text. There is no doubt about it. Otherwise you get in the mess of taking an abstract which is what somebody else thought about the text, as being the equivalent to the text. The only reason the people do it is because it is very difficult to handle complete texts. It is extremely expensive to transcribe it and examine it and then do analyses. Generally speaking, the only things that are done are Shakespeare, the Bible, and Sir Thomas Aquinas. But you cannot do that sort of thing to everybody.

Now, very exaggerated claims have been made for statistical analysis and other things. And it is just as well to think, not whether these things will work, but how far they can work, and whether it is worthwhile pushing them any further. Now it is quite clear that statistical analysis, as it stands, will only go up as far as an anagram of what you are dealing with. All anagrams are the same. Now it is terribly obvious if you are given a lot of words and the number of times you are allowed to use them, you can write a great many articles doing just that. And they are not all the same. Nor would they be indexed all the same, nor would they always be the same claim. This obvious fact seems to have been overlooked.

Nevertheless if you can take the anagram of a paper, going up to a certain degree, that is a very good way of doing it. But do not push it too far because it becomes ridiculous. And this goes for every other method including those that I use myself.

So I would just conclude, without going into details, do try the thing. But there are obvious limits beyond which you should not push precision on these things, when it ceases to be without meaning, in other words, as clearly an anagram will. And also remember, that if you are looking for anything that has large public agreement as to what the words or phrases mean, it cannot be very specific. And if it has to be very specific, it will not be either very widespread nor will it be very stable in time, because where people are most specific, they are changing their interests most often. And this is a great trouble, and the way one hopes to deal with it, is by having thesauruses. But such matters in concordances would have to be revised almost daily. For what we are dealing with is how people use words. We are not dealing immediately with why they do it. So machines at least can keep our things up to date day by day. But you cannot have both stability of your classifications and specificity. That is that. I do not see any way out of it. It is exactly the same thing Compton was telling you. You can have one or you can have the other, but you can not have both.

Mrs. Swanson: There is a collection of about ten years of patents in the chemistry field which has been indexed very roughly by a commercial organization. They have prepared a chemical patent index which I am sure many people are familiar with. Since I had difficulty in examining chemical patents at one time, I had often wondered what the utility of this product would be in at least getting a broad cut to the arts that might be significant in handling an application. And since I have kept this in me for a long time, and this seems to be a forum in which it can be mentioned, I wish to suggest that this product be given a test to see whether it could actually be useful to the patent examiner in the field which is covered. It ties in a bit, I think, with the speaker's comments on concept. The indexing is

not standardized. It is a very rough job, but it may very well be useful, and anything which would cut down the manual operations of looking through piles and piles of patents would appear to be a beneficial thing.

Mr. Van Waasbergen: I would like to reply to what the lady said. The people of this company approached us and we looked into it and we came to the conclusion that for our work it was a little bit too rough. It could be used as an introduction to the study of the patent application, but for that introduction we found it too expensive.

Mr. Kalikow: I would just like to congratulate Mr. Oredsson on his talk. I though it was very provocative. It is completely consistent with the experience that we have had in the General Electric Company in patent searching by mechanical means. We need to watch the crossover point between man and machine, and be able to use the machine to the extent that it will give us advantage and be able to have pertinency factors built into it. Then when you get your retrieval you can take a predetermined amount of overpull whereby the human mind can then make a further decision as to how much further it wishes to go either in reliance on the machine or going back to other methods of searching. Using this machine as a practical tool, and these systems and the programs that he has mentioned as practical tools, actually works very well.

Mr. Pfeffer: I have one brief comment for Mr. Oredsson with respect to his cavalier dismissal of negative limitations. At least it has been our experience, in our practice in this country, that negative limitations are nothing to be ignored, especially with respect to the art dealing with compositions of matter. Now I understand that this is not a subject for patentability in many patent offices, but it is in this country. Quite frequently we find that the best way of expressing the invention is by the use of some sort of negative limitation—for example, a non-aqueous composition or a non-chlorinated azo dye, where the absence of a particular thing is the gist of the invention for the specific result desired. For this purpose the search is a very difficult one for the examiner, because he must find a statement somewhere in a specification which teaches this negative implication. He cannot merely rely upon the fact that some combination of elements has neglected to mention this fact. So this for us becomes quite an important concept, and we cannot ignore it.

Mr. Purdy: Would you mind sir repeating briefly what are your conclusions regarding the different forms of the same concept, such as difference, differentiate, differential, and so forth.

Mr. Oredsson: Well I went over that subject rather quickly. I am afraid I said that to some extent they could be considered as synonyms, and in that way you take care of it in the thesaurus to which Mr. Fairthorne was referring. Otherwise, the meaning is dependent upon the context. I do not know what the people say who have experience in this field.

Mr. Kalikow: I can give you some experience in the field. We use what we call a number of difference thesauruses. One is the root word thesaurus, where all of the words having different endings of the same kind of word, the same kind of meaning, like saturate, saturating, saturated, saturates, and so forth, would all come under one word, which would be the root word thesaurus. Then we move back from that into the representative word thesaurus, which is about equivalent to your Roget's Thesaurus. Then we have that divided into a complex word thesaurus and a basic word thesaurus. You have the complex word thesaurus which is one that has all of the words that are factorable into their component meanings, and then you take the words in that thesaurus and you break them down in terms of the basic word thesaurus that contains words that are very difficult to factor any further. With this kind of a hierarchy of thesaura, you are able to make these equivalences.

Mr. Rotkin: The speaker's comments about the analysis of language sounded familiar but it did not quite fit in until Mr. Kalikow spoke. I am wondering if possibly we have missed a bet by not turning to some of the work that has been done recently in translating machines. What you said sounded exactly the way the recent papers in the translating area have approached the problem of getting what they call information from one language into another.

Mr. Kalikow: I think one of the most encouraging things in this whole field is the way people from many, many different viewpoints are coming to the same conclusion.

Mr. Reznek: I am wondering in this discussion of thesauruses whether we are not concerned with creating sort of a general thesaurus which would be gigantic. Actually what is needed is a thesaurus

that relates to different arts. Words have different meanings within different frames of reference. We mentioned spring. Spring in one is a mechanical concept, another a hydraulic concept, and the third a biological concept. I think we are too much concerned with the meaning of a word which not only has a different frame of reference in an art, but varies from person to person. And you must keep that concept in mind. I want to give an example. I was classifying static structures and I used the word shaft for the generic concept of columns, beams, studs, and so forth. There was not any satisfactory word. When one of my colleagues began to work on the class he said "What is this shaft business?" and I explained it. He said "Well, to me a shaft is a part of a machine, as a rotating shaft." The picture presented to him was entirely different than that to me. That is something that to me is insoluble. We can not have an individual thesaurus for every person. But I think we can have a thesaurus for different arts, and of course we have to determine the extent of the art.

A recess for lunch was called by the Moderator and the meeting reconvened at 2:00 P.M.

Afternoon

Chairman Fay: There has been some indication on the part of some of you that you would like to see the Patent Office. I know some of the foreign visitors have been looking at our operations and comparing notes. One of the men from Canada was there today, looking at certain phases of our work and comparing against problems that he has. Some of you from industry or from universities or research centers may never have seen the Patent Office. If it is your desire we would be very pleased to arrange to have you see any parts of the office that you would like. The visitors from abroad have been invited to a meeting at the Commissioner's office Thursday at 9:00. Now, if anybody else would like to come down either Thursday or Friday and have a tour of the office or look at specific parts of it or see how we are organized, or look at the examining function or our mechanical search division, if you will indicate your desires on your pads, Mr. Gorecki will collect them and we will attempt to arrange such things as we are able to do. As far as I know, all of Thursday and Friday, we can arrange for tours or discussions with our people, and if there is anything else that we can do for you while you are here in Washington, please ask us and we will do our best to comply. Are there any questions? I also want to say that the Commissioner hopes that the Workshop is going well, and that you are enjoying it. If we can do anything more on this let us know. I appreciate Dr. Davis' helping this morning. Thank you.

Dr. Davis: Thank you, Commissioner Fay. We will now have the paper by Morris O. Wolk, Assistant Chief of Division 43, the United States Patent Office, which includes bleaching, dyeing, preserving and medicine. I hope the medicine and "dyeing" do not have anything to do with each other. He is a chemical engineer and has a law degree as well. The title is "Information Display for Encoding and Post-Retrieval Benefits." I hope somebody tells me about what this encoding means some day. Maybe he will. Mr. Wolk.

Mr. Wolk: This meeting has been labeled a "workshop" on information retrieval. This talk is planned, in part, as a workshop demonstration on information display.

In the folder which each of you has received there are numerous drawings which we will be referring to. This is obviously necessary since our subject is information display or presentation (the latter term being now popular and equally applicable). So I will refer to an item in your packet and expect that you will have it before you for inspection as it is being discussed.

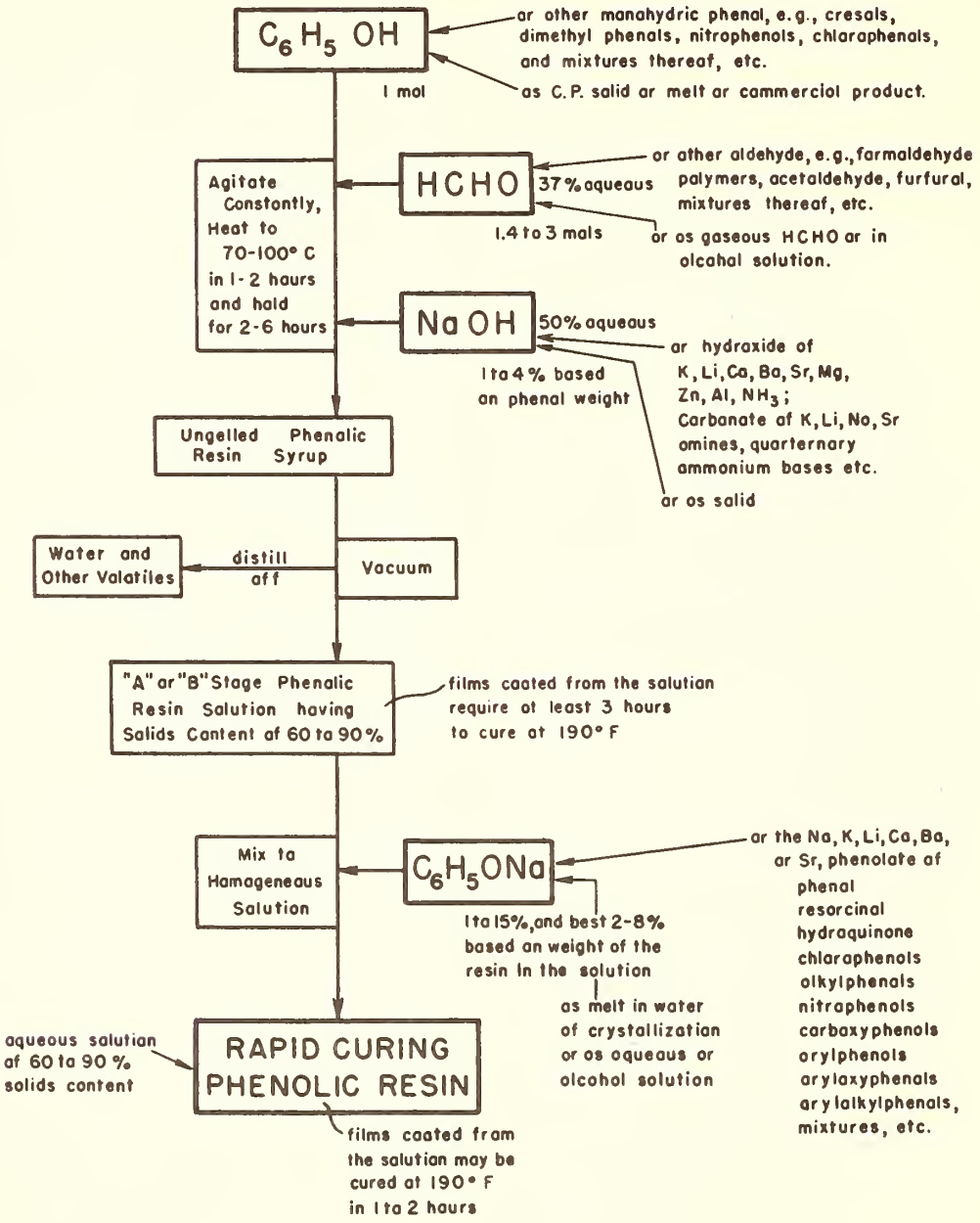
Some of the material may be regarded now as being well proved. I refer, for example, to your xerographed copies of the drawings of the four patents as issued to Webber, Silver, Rogers and Douglas. The well-proved part is the use of a single standard pattern of drawing in chemical process cases, which we will hereinafter draw attention to as designatable as being of modular design. There will be subsequent comment regarding these.

Other parts of the materials supplied are new, as far as is known; involve extension to mechanical patents of ideas on information display previously urged for chemical patents, and may generate active discussion from our friends primarily interested in mechanical patents. For example, your packet material on the drawings, or modified drawings, on the Veit and the Scott patents, are respectively, on a method of forming riveted joints and on a doctor-blade.

A suggestion will be made that Chemical Abstracts or British Chemical Abstracts or any other such abstract journal could well use the drawings of patents such as those of Webber, Silver, Rogers

PHENOLIC RESIN PRODUCTS AND THEIR PRODUCTION

Filed Aug. 2, 1952


C_6H_5OH
or other monohydric phenol, e.g., cresols, dimethyl phenols, nitrophenols, chlorophenols, and mixtures thereof, etc.
as C.P. solid or melt or commercial product.
1 mol
HCHO
37% aqueous
or other aldehyde, e.g., formaldehyde polymers, acetaldehyde, furfural, mixtures thereof, etc.
1.4 to 3 mols
or as gaseous HCHO or in alcohol solution.
Agitate Constantly, Heat to 70-100° C in 1-2 hours and hold for 2-6 hours
NaOH
50% aqueous
or hydroxide of K, Li, Ca, Ba, Sr, Mg, Zn, Al, NH_3; Carbonate of K, Li, Na, Sr omines, quarternary ammonium bases etc.
1 to 4% based on phenol weight
or as solid
Ungelled Phenolic Resin Syrup
Water and Other Volatiles
distill off
Vacuum
"A" or "B" Stage Phenolic Resin Solution having Solids Content of 60 to 90%
films coated from the solution require at least 3 hours to cure at 190° F
Mix to Homogeneous Solution
C_6H_5ONa
or the Na, K, Li, Ca, Ba, or Sr, phenolate of phenol resorcinol hydroquinone chlorophenols alkylphenols nitrophenols carboxyphenols arylphenols arylaxyphenols arylalkylphenols, mixtures, etc.
1 to 15%, and best 2-8% based on weight of the resin in the solution
as melt in water of crystallization or as aqueous or alcohol solution
aqueous solution of 60 to 90% solids content
RAPID CURING PHENOLIC RESIN
films coated from the solution may be cured at 190° F in 1 to 2 hours

INVENTOR
Charles S. Webber

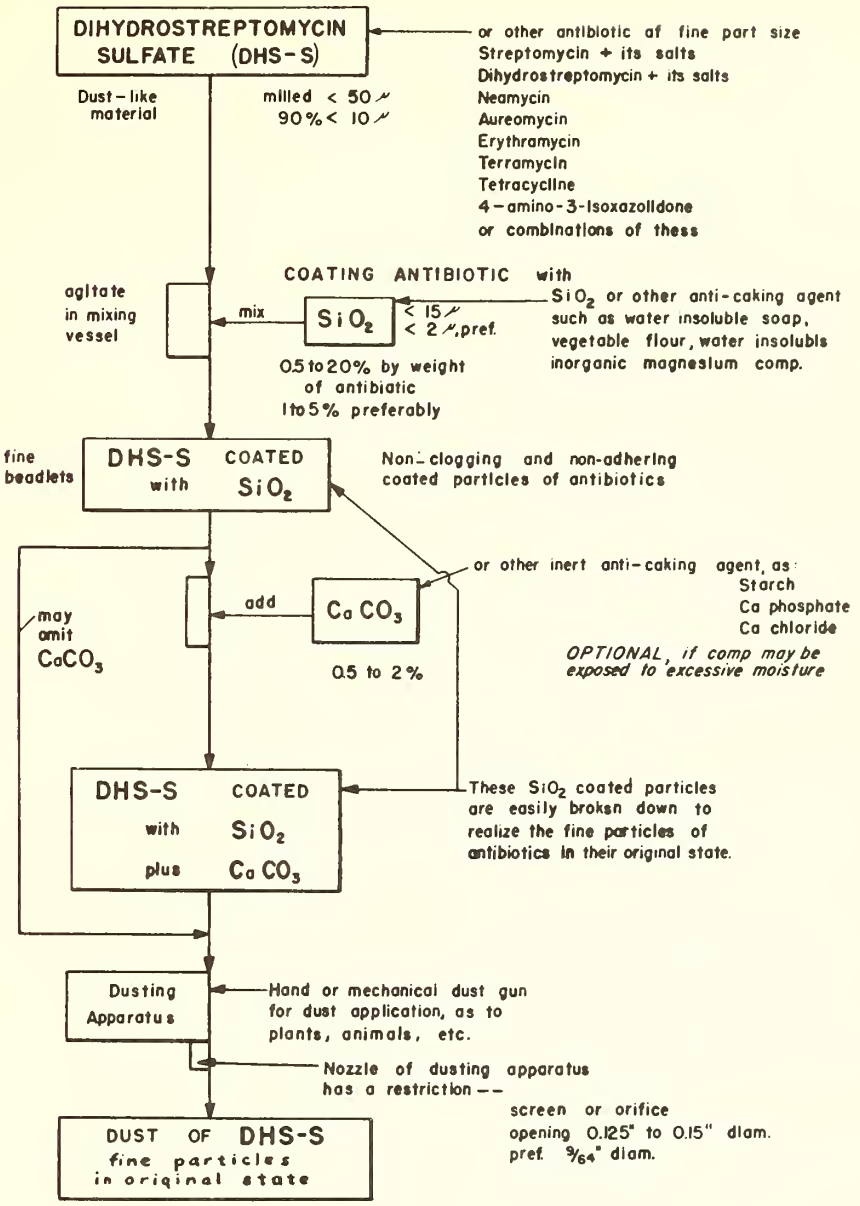
BY Carroll F. Palmer

ATTORNEY

Figure 1

ANTIBIOTIC DUSTS

Filed Nov. 12, 1957

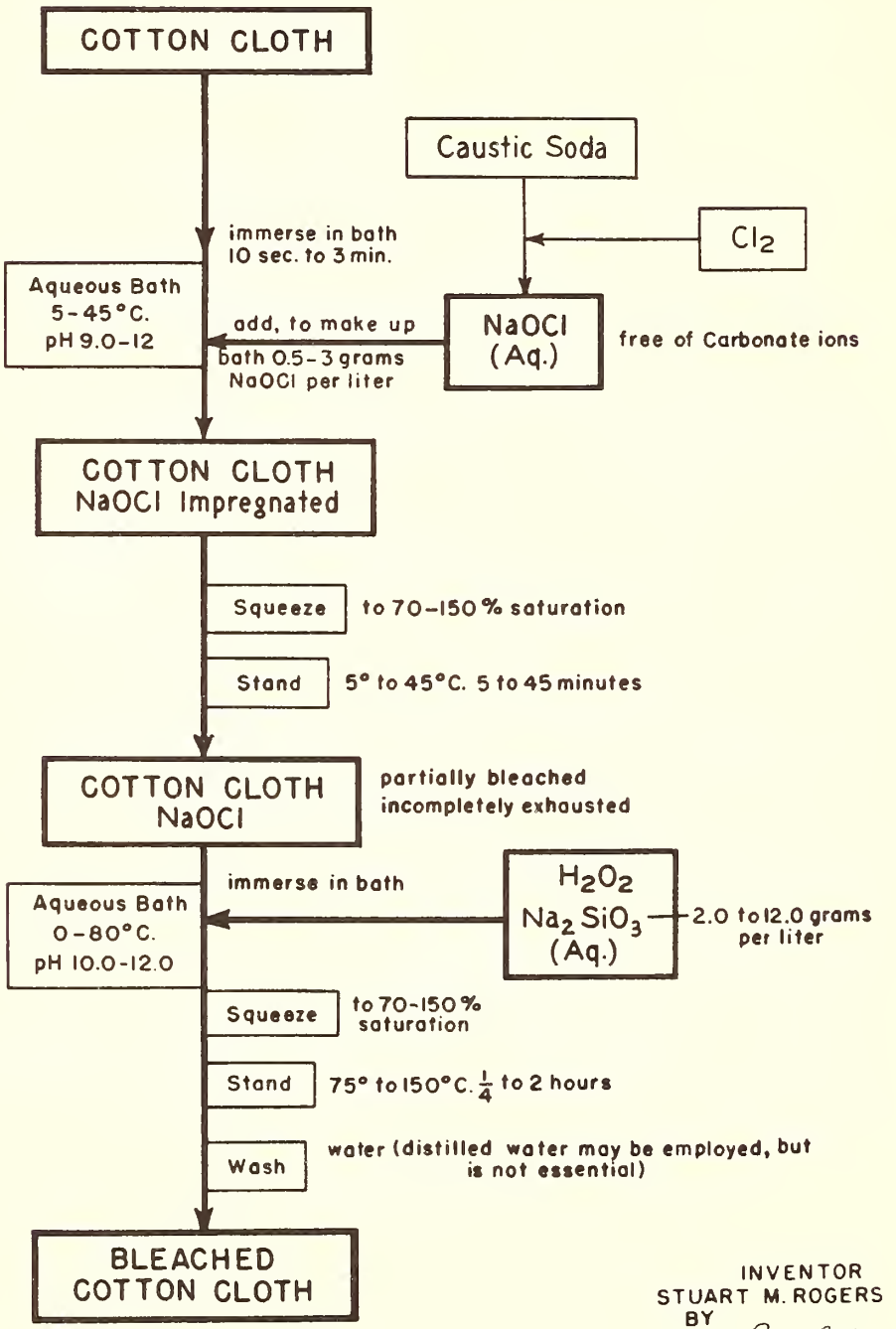

DIHYDROSTREPTOMYCIN SULFATE (DHS-S)
or other antibiotic of fine part size
Streptomycin + its salts
Dihydrostreptomycin + its salts
Neamycin
Aureomycin
Erythramycin
Terramycin
Tetracycline
4-amino-3-isoxazolidone
or combinations of these
Dust-like material
milled < 50 μ
90% < 10 μ
agitate in mixing vessel
mix
COATING ANTIBIOTIC with
SiO2 or other anti-caking agent such as water insoluble soap, vegetable flour, water insolubls inorganic magnesium comp.
SiO2
< 15 μ
< 2 μ, pref.
0.5 to 20% by weight of antibiatic
1 to 5% preferably
fine beadlets
DHS-S COATED with SiO2
Non-clogging and non-adhering coated particles of antibiotics
or other inert anti-caking agent, as:
Starch
Ca phosphate
Ca chloride
OPTIONAL, if comp may be exposed to excessive moisture
may omit CaCO3
add
Ca CO3
0.5 to 2%
DHS-S COATED with SiO2 plus Ca CO3
These SiO2 coated particles are easily broksn down to realize the fine particles of antibiotics in their original state.
Dusting Apparatus
Hand or mechanical dust gun for dust application, as to plants, animals, etc.
Nozzle of dusting apparatus has a restriction --
screen or orifice opening 0.125" to 0.15" diam. pref. 9/64" diam.
DUST OF DHS-S
fine particles in original state

INVENTOR.
Leonard H. Silver
BY
Howard E. Rogers Jr
ATTORNEY

Figure 2

$NaOCL-H_2O_2$ COTTON CLOTH BLEACHING

Filed July 3, 1957



INVENTOR
STUART M. ROGERS
BY
Alvin Engelstein
ATTORNEY

Figure 3

FICUS ENZYME AND HYDROPHILIC CARRIER COMPOSITION

Filed April 17, 1957

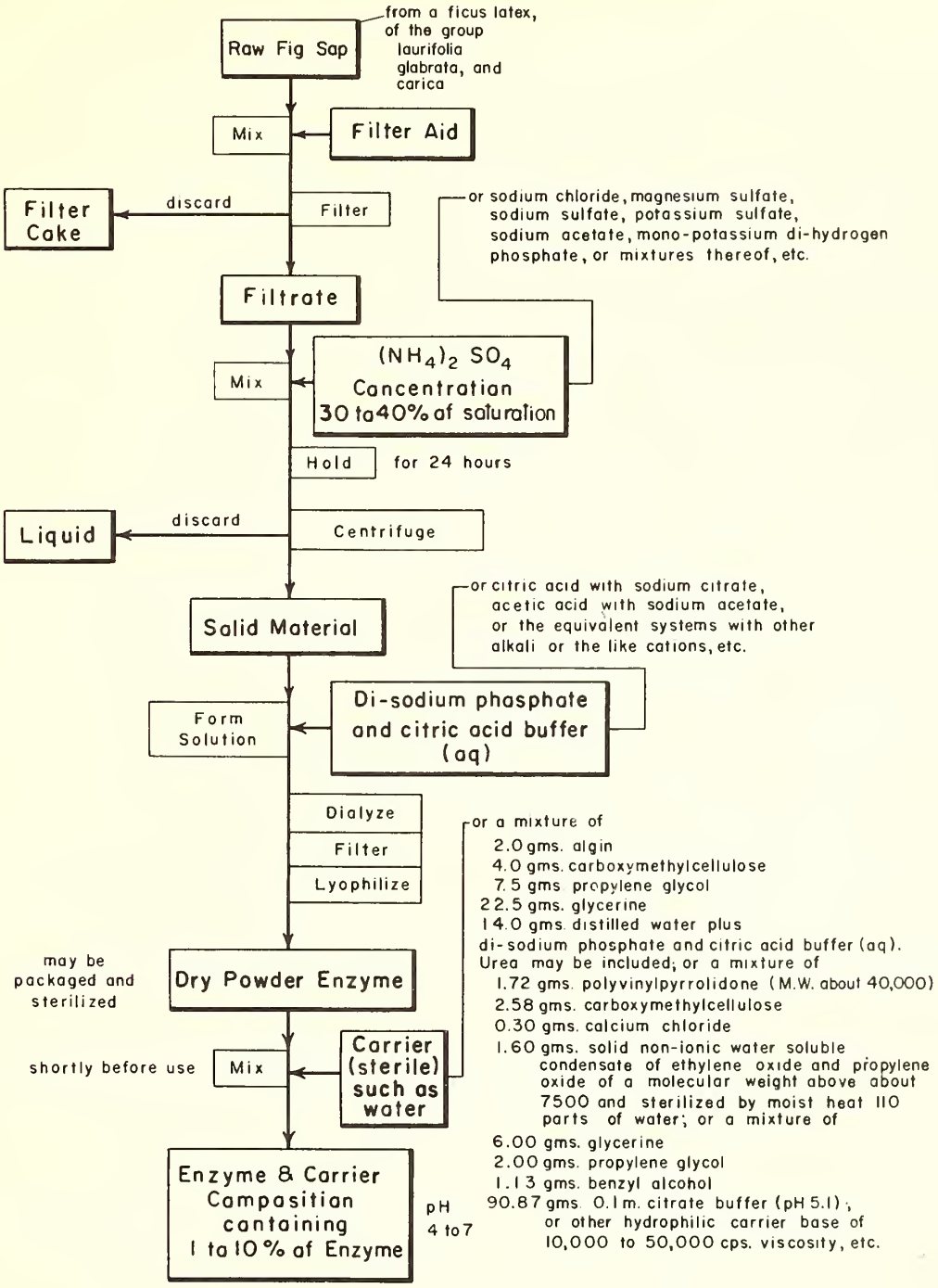

Raw Fig Sap
from a ficus latex, of the group laurifolia glabrata, and carica
Mix
Filter Aid
Filter Cake
discard
Filter
or sodium chloride, magnesium sulfate, sodium sulfate, potassium sulfate, sodium acetate, mono-potassium di-hydrogen phosphate, or mixtures thereof, etc.
Filtrate
Mix
$(NH_4)_2 SO_4$ Concentration 30 to 40% of saturation
Hold
for 24 hours
Liquid
discard
Centrifuge
Solid Material
or citric acid with sodium citrate, acetic acid with sodium acetate, or the equivalent systems with other alkali or the like cations, etc.
Form Solution
Di-sodium phosphate and citric acid buffer (aq)
Dialyze
Filter
Lyophilize
or a mixture of
2.0 gms. algin
4.0 gms. carboxymethylcellulose
7.5 gms. propylene glycol
22.5 gms. glycerine
14.0 gms. distilled water plus
di-sodium phosphate and citric acid buffer (aq).
Urea may be included; or a mixture of
1.72 gms. polyvinylpyrrolidone (M.W. about 40,000)
2.58 gms. carboxymethylcellulose
0.30 gms. calcium chloride
1.60 gms. solid non-ionic water soluble condensate of ethylene oxide and propylene oxide of a molecular weight above about 7500 and sterilized by moist heat 110 parts of water; or a mixture of
6.00 gms. glycerine
2.00 gms. propylene glycol
1.13 gms. benzyl alcohol
90.87 gms. 0.1 m. citrate buffer (pH 5.1), or other hydrophilic carrier base of 10,000 to 50,000 cps. viscosity, etc.
may be packaged and sterilized
Dry Powder Enzyme
shortly before use
Mix
Carrier (sterile) such as water
Enzyme & Carrier Composition containing 1 to 10% of Enzyme
pH 4 to 7

Figure 4

JAN. 11, 1955 L. H. CONOVER 2,699,054

TETRACYCLINE

Filed Oct. 9, 1953 2 sheets, sheet 1

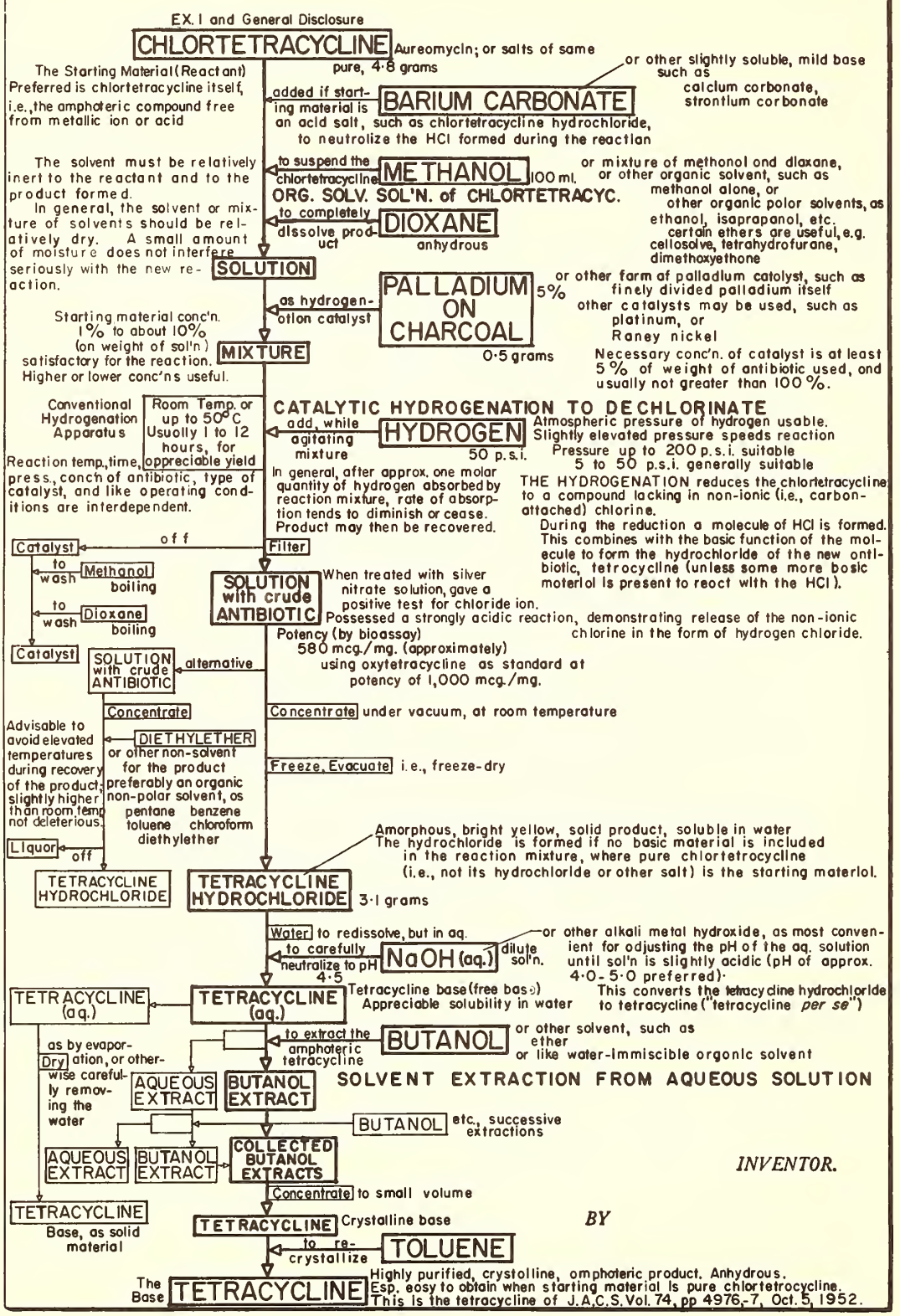
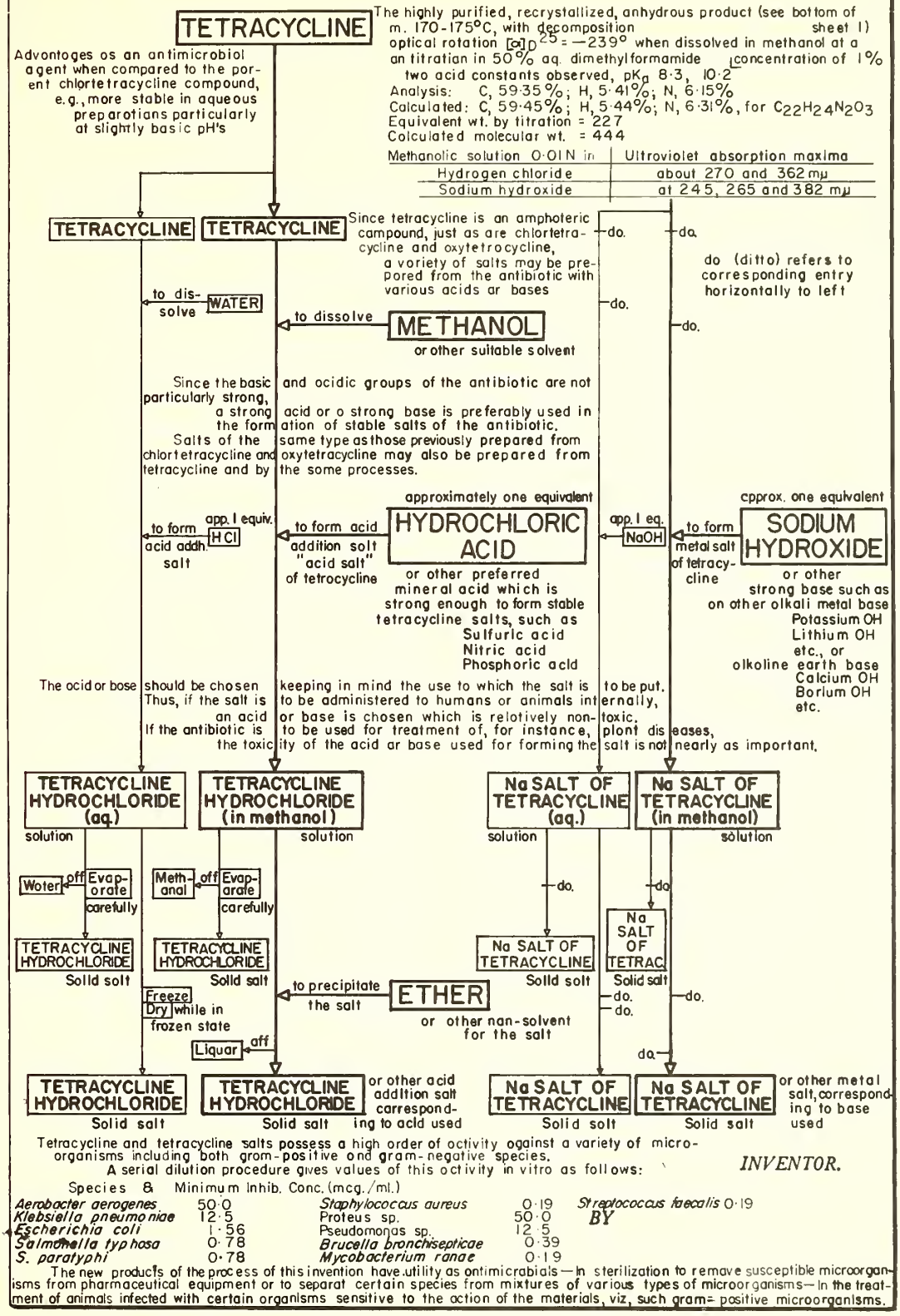

EX. I and General Disclosure
CHLORTETRACYCLINE
Aureomycin; or salts of same
pure, 4·8 grams
The Starting Material (Reactant) Preferred is chlortetracycline itself, i.e., the amphoteric compound free from metallic ion or acid
added if starting material is an acid salt, such as chlortetracycline hydrochloride, to neutralize the HCl formed during the reaction
or other slightly soluble, mild base such as calcium carbonate, strontium carbonate
BARIUM CARBONATE
to suspend the chlortetracycline
METHANOL
100 ml.
or mixture of methonol and dioxane, or other organic solvent, such as methanol alone, or other organic polar solvents, as ethanol, isapropanol, etc. certain ethers are useful, e.g. cellosolve, tetrahydrofurane, dimethoxyethone
ORG. SOLV. SOL'N. of CHLORTETRACYC.
to completely dissolve product
DIOXANE
anhydrous
The solvent must be relatively inert to the reactant and to the product formed. In general, the solvent or mixture of solvents should be relatively dry. A small amount of moisture does not interfere seriously with the new reaction.
SOLUTION
as hydrogenation catalyst
PALLADIUM ON CHARCOAL
5%
0·5 grams
or other form of palladium catalyst, such as finely divided palladium itself
other catalysts may be used, such as platinum, or Raney nickel
Necessary conc'n. of catalyst is at least 5% of weight of antibiotic used, and usually not greater than 100%.
Starting material conc'n. 1% to about 10% (on weight of sol'n) satisfactory for the reaction. Higher or lower conc'ns useful.
MIXTURE
CATALYTIC HYDROGENATION TO DECHLORINATE
Conventional Hydrogenation Apparatus
Room Temp. or up to 50°C Usually 1 to 12 hours, for appreciable yield
Reaction temp., time, press., conc'n of antibiotic, type of catalyst, and like operating conditions are interdependent.
add, while agitating mixture
HYDROGEN
50 p.s.i.
Atmospheric pressure of hydrogen usable. Slightly elevated pressure speeds reaction
Pressure up to 200 p.s.i. suitable
5 to 50 p.s.i. generally suitable
In general, after approx. one molar quantity of hydrogen absorbed by reaction mixture, rate of absorption tends to diminish or cease. Product may then be recovered.
THE HYDROGENATION reduces the chlortetracycline to a compound lacking in non-ionic (i.e., carbon-attached) chlorine.
During the reduction a molecule of HCl is formed. This combines with the basic function of the molecule to form the hydrochloride of the new antibiotic, tetracycline (unless some more basic material is present to react with the HCl).
Catalyst off
Filter
to wash Methanol boiling
to wash Dioxane boiling
SOLUTION with crude ANTIBIOTIC
When treated with silver nitrate solution, gave a positive test for chloride ion.
Possessed a strongly acidic reaction, demonstrating release of the non-ionic chlorine in the form of hydrogen chloride.
Potency (by bioassay) 580 mcg./mg. (approximately) using oxytetracycline as standard at potency of 1,000 mcg./mg.
Catalyst
SOLUTION with crude ANTIBIOTIC
alternative
Concentrate
Concentrate under vacuum, at room temperature
Advisable to avoid elevated temperatures during recovery of the product; slightly higher than room temp not deleterious.
DIETHYLETHER
or other non-solvent for the product preferably an organic non-polar solvent, as pentane benzene toluene chloroform diethylether
Freeze, Evacuate i.e., freeze-dry
Liquor off
Amorphous, bright yellow, solid product, soluble in water
The hydrochloride is formed if no basic material is included in the reaction mixture, where pure chlortetrocycline (i.e., not its hydrochloride or other salt) is the starting material.
TETRACYCLINE HYDROCHLORIDE
TETRACYCLINE HYDROCHLORIDE
3·1 grams
Water to redissolve, but in aq.
to carefully neutralize to pH 4·5
NaOH (aq.)
dilute sol'n.
or other alkali metal hydroxide, as most convenient for adjusting the pH of the aq. solution until sol'n is slightly acidic (pH of approx. 4·0-5·0 preferred).
This converts the tetracycline hydrochloride to tetracycline ("tetracycline per se")
TETRACYCLINE (aq.)
TETRACYCLINE (aq.)
Tetracycline base (free base)
Appreciable solubility in water
to extract the amphoteric tetracycline
BUTANOL
or other solvent, such as ether or like water-immiscible organic solvent
Dry as by evaporation, or otherwise carefully removing the water
AQUEOUS EXTRACT
BUTANOL EXTRACT
SOLVENT EXTRACTION FROM AQUEOUS SOLUTION
BUTANOL
etc., successive extractions
AQUEOUS EXTRACT
BUTANOL EXTRACT
COLLECTED BUTANOL EXTRACTS
INVENTOR.
Concentrate to small volume
TETRACYCLINE Base, as solid material
TETRACYCLINE
Crystalline base
BY
to re-crystallize
TOLUENE
The Base
TETRACYCLINE
Highly purified, crystolline, omphoteric product. Anhydrous.
Esp. easy to obtain when starting material is pure chlortetrocycline.
This is the tetracycline of J.A.C.S. Vol. 74, pp 4976,-7, Oct. 5, 1952.

Figure 5

JAN. 11, 1955 L. H. CONOVER 2,699,054

TETRACYCLINE

Filed Oct. 9, 1953 2 sheets, sheet 2


TETRACYCLINE
Advantages as an antimicrobial agent when compared to the parent chlortetracycline compound, e.g., more stable in aqueous preparations particularly at slightly basic pH's
The highly purified, recrystallized, anhydrous product (see bottom of sheet 1)
m. 170-175°C, with decomposition
optical rotation $[\alpha]_D^{25} = -239°$ when dissolved in methanol at a concentration of 1% in titration in 50% aq. dimethylformamide
two acid constants observed, pK_a 8·3, 10·2
Analysis: C, 59·35%; H, 5·41%; N, 6·15%
Calculated: C, 59·45%; H, 5·44%; N, 6·31%, for $C_{22}H_{24}N_2O_3$
Equivalent wt. by titration = 227
Calculated molecular wt. = 444
Methanolic solution 0·01 N in | Ultraviolet absorption maxima
Hydrogen chloride | about 270 and 362 mμ
Sodium hydroxide | at 245, 265 and 382 mμ
TETRACYCLINE
TETRACYCLINE
Since tetracycline is an amphoteric compound, just as are chlortetracycline and oxytetracycline, a variety of salts may be prepared from the antibiotic with various acids or bases
do. do.
do (ditto) refers to corresponding entry horizontally to left
do.
to dissolve METHANOL or other suitable solvent
to dissolve WATER
do.
Since the basic and acidic groups of the antibiotic are not particularly strong, a strong acid or a strong base is preferably used in the formation of stable salts of the antibiotic. Salts of the same type as those previously prepared from chlortetracycline and oxytetracycline may also be prepared from tetracycline and by the some processes.
approximately one equivalent
cpprox. one equivalent
to form acid addition salt "acid salt" of tetrocycline
app. 1 equiv. HCl
to form acid addh. salt
HYDROCHLORIC ACID or other preferred mineral acid which is strong enough to form stable tetracycline salts, such as Sulfuric acid, Nitric acid, Phosphoric acid
app. 1 eq. NaOH
to form metal salt of tetracycline
SODIUM HYDROXIDE or other strong base such as an other alkali metal base Potassium OH, Lithium OH, etc., or alkoline earth base Calcium OH, Borium OH, etc.
The acid or base should be chosen keeping in mind the use to which the salt is to be put. Thus, if the salt is to be administered to humans or animals internally, an acid or base is chosen which is relatively non-toxic. If the antibiotic is to be used for treatment of, for instance, plant diseases, the toxicity of the acid or base used for forming the salt is not nearly as important.
TETRACYCLINE HYDROCHLORIDE (aq.) solution
TETRACYCLINE HYDROCHLORIDE (in methanol) solution
Na SALT OF TETRACYCLINE (aq.) solution
Na SALT OF TETRACYCLINE (in methanol) solution
Water off Evaporate carefully
Methanol off Evaporate carefully
do. do.
TETRACYCLINE HYDROCHLORIDE Solid salt
TETRACYCLINE HYDROCHLORIDE Solid salt
Na SALT OF TETRACYCLINE Solid salt
Na SALT OF TETRAC. Solid salt
to precipitate the salt ETHER or other non-solvent for the salt
Freeze Dry while in frozen state
Liquor off
do. do.
do. do.
do.
TETRACYCLINE HYDROCHLORIDE Solid salt
TETRACYCLINE HYDROCHLORIDE Solid salt
or other acid addition salt corresponding to acid used
Na SALT OF TETRACYCLINE Solid salt
Na SALT OF TETRACYCLINE Solid salt
or other metal salt, corresponding to base used

Tetracycline and tetracycline salts possess a high order of activity against a variety of microorganisms including both gram-positive and gram-negative species.

A serial dilution procedure gives values of this activity in vitro as follows:

INVENTOR.

BY

Species &	Minimum Inhib. Conc. (mcg./ml.)				
Aerobacter aerogenes	50·0	*Staphylococcus aureus*	0·19	*Streptococcus faecalis*	0·19
Klebsiella pneumoniae	12·5	Proteus sp.	50·0		
Escherichia coli	1·56	Pseudomonas sp.	12·5		
Salmonella typhosa	0·78	*Brucella bronchisepticae*	0·39		
S. paratyphi	0·78	*Mycobacterium ranae*	0·19		

The new products of the process of this invention have utility as antimicrobials—in sterilization to remove susceptible microorganisms from pharmaceutical equipment or to separat certain species from mixtures of various types of microorganisms—in the treatment of animals infected with certain organisms sensitive to the action of the materials, viz, such gram-positive microorganisms.

Figure 6

645802 O—63——10

and Douglas (Figs. 1–4) as the *complete* abstract of each patent, without requiring any abstractor's services.

We will go into the mechanics of making these drawings, and disclose what we have found to be the best time-saving approach and apparatus.

The packet also includes a copy of the May 1949 Journal of the Patent Office Society, containing many drawings, a few of which will be referred to, for example, those corresponding to the four 30″ by 40″ blow-ups on the easel. Likewise, a May 1955 reprint of another J.P.O.S. article is present (the post-patenting drawing on the tetracycline patent). (Figs. 5 and 6.)

But, before going into this material in more detail, we might stop to inquire a little more about the title of this discussion. Particularly, we must now touch on the "encoding and post-retrieval benefits."

The approach can be on the basis of assuming that a suitable electronic or other machine and system for retrieval of information is settled upon. We could ask: "What kind of document will it retrive, where patents are the subject matter?" Will patents as now generally published be a satisfactory form as the ultimate goal of the retrieval process, or should an effort be made to streamline the information display of patents, to facilitate comprehension of the art contents of the patent document after it has been retrieved? The present discussion is based on the view that a considerable amount of facilitation of comprehension of the subject matter of patents can be accomplished. In the chemical patents, (see any one of the Webber, Silver, Rogers or Douglas patent drawings and the tetracycline drawings, for example) the drawings of the form here shown facilitate comprehension of the subject matter by presenting the overall process and the specific details of each step in the process, these details being located at the particular step of the process to which they pertain.

These patents were selected for your packets as demonstrating in part, what can be done to facilitate comprehension of chemical patents, and quick recognition of the disclosure of these patents. This form of presentation is at present found in relatively few patents, although it was first urged in 1948.

Therefore, I am assuming that, for post-retrieval benefits, it would be desirable that patent documents be improved to facilitate comprehension by the ultimate user.

But, any retrieval system of the kind being contemplated requires encoding of the information to be stored for retrieval. The encoding process involves as an essential element, analysis of the document and comprehension is the same at encoding as it is at post-retrieval. Additionally, at encoding, it is essential that *all* the art teachings of the patent document be available for encoding. The encoding stage is therefore the critical point, before which the art contents of the patent must be in readily available form.

Mr. Pfeffer of the organizing committee of this workshop has informed me that the Research and Development group of the Patent Office plans to proceed to encoding of more complex information than it has attempted to date, and that it will become essential to convert the information of the chemical patents they will be working on, to a more readily comprehensible form. In his opinion, it will be necessary to first put the information in some form, such as that in the J.P.O.S. articles, which is the form followed by, for example, Webber, Silver, etc. It is contemplated that this will be carried out in one of the projects in R & D. Mr. Pfeffer stated that after this conversion is made, the conversion product could be used for information exchange on an international basis between patent offices of the various countries.

Accordingly, we can also conclude that for encoding benefits, it would be desirable that patent documents be improved to facilitate comprehension by the encoder. This improved form should be preserved to obtain the same benefits post-retrieval.

At this point it would seem appropriate to look at the blow-ups on the easel. They correspond to pages 344, and 347, 366 and 367 of the May 1949 J.P.O.S. in your hands. This constitutes a striking demonstration of the differences in comprehension contributed by change in form alone to the straight line vertical flow, right hand horizontal attack form. Exactly the same information is contained in both of these diagrams. It is clear that the information display or presentation on page 347 (Fig. 8), is tremendously superior to that of page 344. (Fig. 7.)

But the diagram of Fig. 8 would not provide sufficient analysis for encoding, since *all* the details of art are required to be available for encoding. Likewise, for post-retrieval purposes, early reference to and time-consuming analysis of the written disclosure would be required, since the metal involved is shown only generically and the details are few.

Now by turning to pages 366 and 367 (Figs. 9 and 10, respectively) we find in two sheets of drawings essentially the entire disclosure of the patent. It is clear that these two sheets would provide an analysis of the patent to facilitate comprehension for encoding and for post-retrieval use. In the latter, or "ultimate consumer's use," the saving in time will be effected on each and every subsequent use, whether this use will be by patent examiners, patent searchers, chemical researchers, attorneys, judges, or anyone else.

At this point I would like to ask you to visualize with me the following: Picture a chemical patent examiner at work today. He has just picked up an amended application and is preparing to give it a responsive action. There is no drawing in the application. The first office action has cited eight references. The examiner might or might not have been the one who made the first action. Let us assume the best situation—he was the examiner who gave the first examination. But that was a year ago (assuming the examiner is acting on amended cases six months after receipt), and he has no strong recollection of the case. He reads his first action. It makes good sense to him. He then reads the attorney's response. Facts from the eight references and arguments concerning them have been assembled by the attorney and a conclusion reached by the attorney, directly contrary to the examiner's in his first action. Now the examiner is no longer certain of his facts or grounds of rejection. He must restudy the application's specification and each of the eight references. This can be a very great time consumer, but must be done before the examiner can come to a valid conclusion.

Let us change the situation a little. Assume that the application as filed had a drawing "information display" presenting the full disclosure along the lines of the drawings at pages 366 and 367 of the J.P.O.S. as referred to above (i.e., Figs. 9 and 10) or like the tetracycline patent drawings (Figs. 5 and 6). Further assume that each of eight references had, similarly, a drawing or drawings presenting in full the art disclosure of its patent. Wouldn't this examiner be in very good shape to expeditiously determine the facts? Extend this to all chemical examination—all applications being filed with such drawings, and all references having such drawings. Do we have here a key to overcoming the "backlog"—that is, to reducing the number of active applications present in the Patent Office—now about 200,000 cases resulting in extended average pendency for all applications?

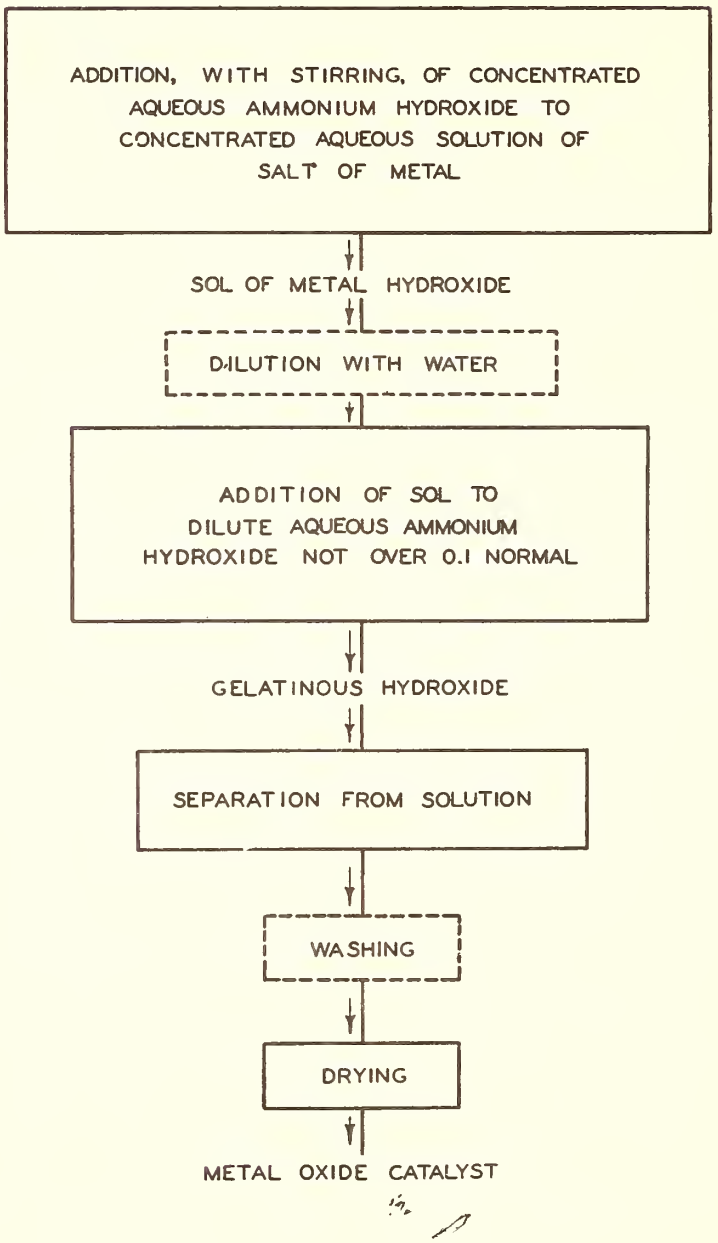
There is at present, as there should be, a great foment of self-examination in attempting to find an answer to the "backlog." It is clear that some curative ingredient must be invoked. Minor palliatives won't do. The question I would like to see you ponder is whether the picture just invoked, of applications filed with full information display for almost immediate comprehension, and of patent references, each with full information display for immediate or almost immediate comprehension, would help to take care of the "backlog," or in any event, permit the Patent Office to truly carry out its examination job more expeditiously? Extend the picture to include mechanical and electrical patents. In other words, picture a situation where each application file contains its information displayed in a manner for immediate or almost immediate comprehension, and each reference has its information displayed similarly. Could not this be a good part of the missing curative ingredients?

While picturing this, let us not lose the significance of the above assumption of *applications as filed* containing information displays for almost immediate comprehension. In the United States there are about 7,500 registered patent attorneys and agents (and their mechanical drafting staffs) and 83,000 or more applicants for patents per year. If they can be trained to file with their applications information displays presenting their art teachings for immediate or almost immediate comprehension, the Patent Office examining corps has been augmented from its present 1,000 or so examiners, by an external staff of 90,000 or so, while reducing the time the examiner must spend on each case he acts on, because of the improved information display in applications and references. In other words, the Patent Office will have succeeded in "farming out" a significant part of its work to a vast working staff throughout the country and in fact, throughout the world. And it would be a proper placing of a burden upon those seeking a privilege, provided that the Patent Office does its proper share by supplying a plan and instructions for such information displays.

Can we properly feel that this is what we are setting about doing here and now at this Workshop?

In expediting the examination work of the Patent Offices, the importance of the role of mechanical or electronic information retrieval cannot be forgotten. Work must continue on it. But

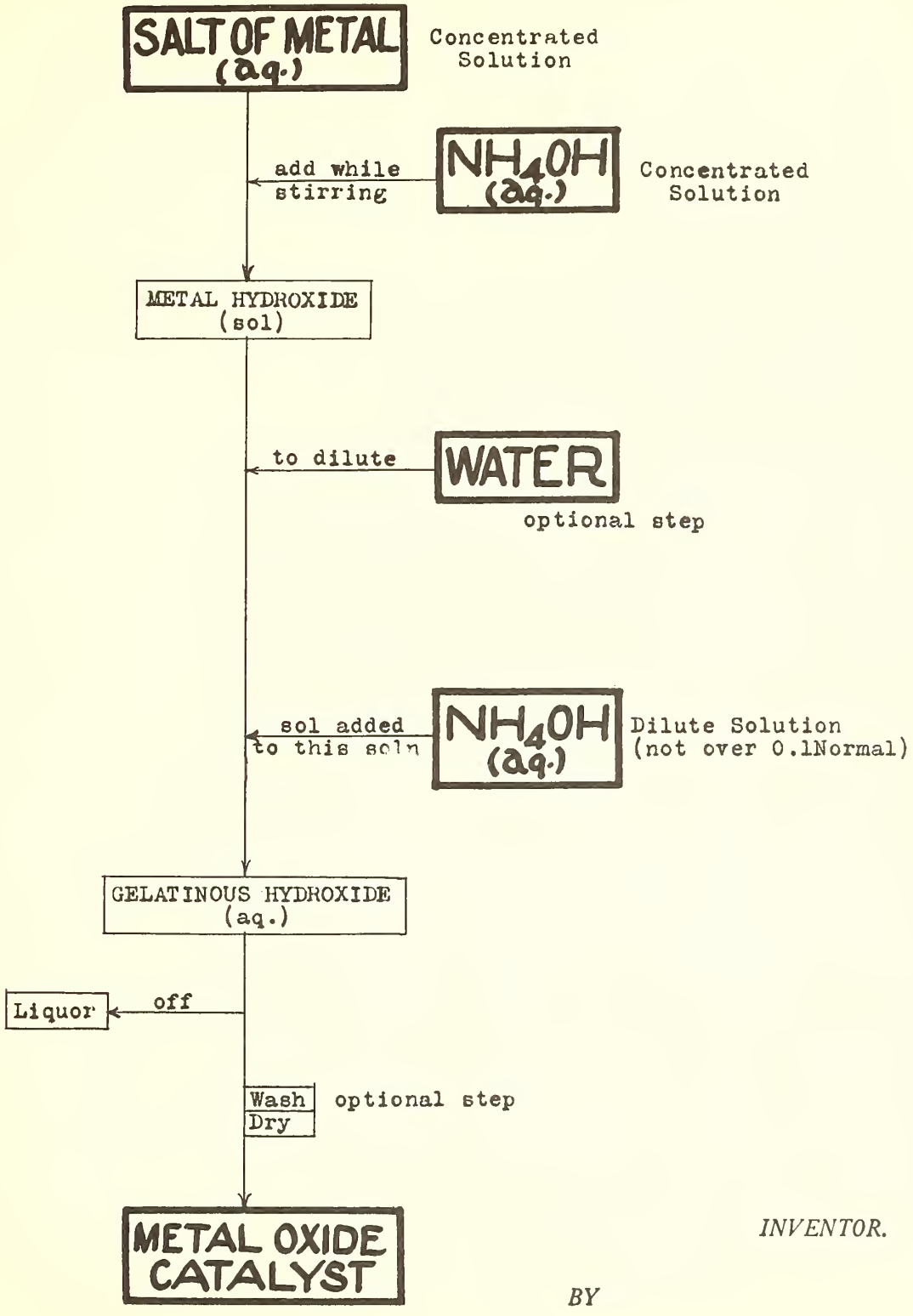
PREPARATION OF CATALYST AND METHOD FOR DEHYDROGENATING HYDROCARBONS WITH SAME
Filed Feb. 5, 1942


ADDITION, WITH STIRRING, OF CONCENTRATED AQUEOUS AMMONIUM HYDROXIDE TO CONCENTRATED AQUEOUS SOLUTION OF SALT OF METAL
SOL OF METAL HYDROXIDE
DILUTION WITH WATER
ADDITION OF SOL TO DILUTE AQUEOUS AMMONIUM HYDROXIDE NOT OVER 0.1 NORMAL
GELATINOUS HYDROXIDE
SEPARATION FROM SOLUTION
WASHING
DRYING
METAL OXIDE CATALYST

INVENTOR
MARYAN P. MATUSZAK
BY Hudson, Young & Yingling
ATTORNEY

Figure 7

PREPARATION OF CATALYST AND METHOD FOR
DEHYDROGENATING HYDROCARBONS WITH SAME
Pat. No. 2,379,172



INVENTOR.

BY

Figure 8

PREPARATION OF CATALYST AND METHOD FOR DEHYDROGENATING HYDROCARBONS WITH SAME
Pat. No. 2,379,172

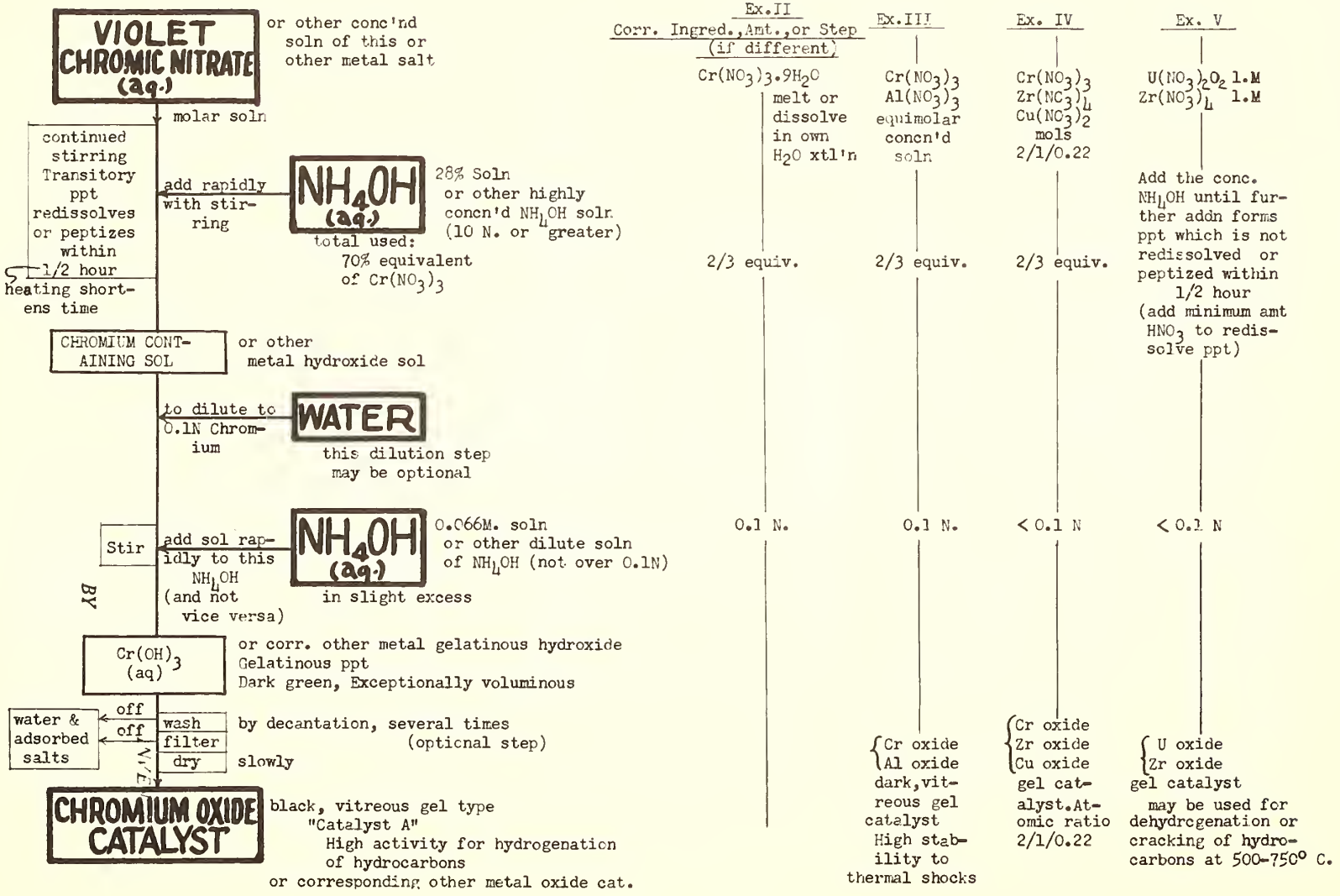

VIOLET CHROMIC NITRATE (aq.)
or other conc'nd soln of this or other metal salt
molar soln
continued stirring Transitory ppt redissolves or peptizes within 1/2 hour
heating shortens time
add rapidly with stirring
NH4OH (aq.)
28% Soln or other highly concn'd NH4OH soln. (10 N. or greater)
total used: 70% equivalent of Cr(NO3)3
CHROMIUM CONTAINING SOL
or other metal hydroxide sol
to dilute to 0.1N Chromium
WATER
this dilution step may be optional
Stir
add sol rapidly to this NH4OH (and not vice versa)
NH4OH (aq.)
0.066M. soln or other dilute soln of NH4OH (not over 0.1N)
in slight excess
BY
Cr(OH)3 (aq)
or corr. other metal gelatinous hydroxide
Gelatinous ppt
Dark green, Exceptionally voluminous
water & adsorbed salts
off
off
wash
filter
dry
by decantation, several times (opticnal step)
slowly
WET
CHROMIUM OXIDE CATALYST
black, vitreous gel type
"Catalyst A"
High activity for hydrogenation of hydrocarbons
or corresponding other metal oxide cat.
Ex.II
Corr. Ingred., Amt., or Step (if different)
Cr(NO3)3.9H2O melt or dissolve in own H2O xtl'n
2/3 equiv.
0.1 N.
Ex.III
Cr(NO3)3 Al(NO3)3 equimolar concn'd soln
2/3 equiv.
0.1 N.
Cr oxide
Al oxide
dark, vitreous gel catalyst
High stability to thermal shocks
Ex. IV
Cr(NO3)3 Zr(NO3)4 Cu(NO3)2 mols 2/1/0.22
2/3 equiv.
< 0.1 N
Cr oxide
Zr oxide
Cu oxide
gel catalyst. Atomic ratio 2/1/0.22
Ex. V
U(NO3)2O2 1.M
Zr(NO3)4 1.M
Add the conc. NH4OH until further addn forms ppt which is not redissolved or peptized within 1/2 hour (add minimum amt HNO3 to redissolve ppt)
< 0.1 N
U oxide
Zr oxide
gel catalyst
may be used for dehydrogenation or cracking of hydrocarbons at 500-750° C.

Figure 9

Ex. VI

$Al(NO_3)_3 \cdot 9H_2O$ 453.6grams
$Cr(NO_3)_3 \cdot 9H_2O$ 32.5grams
(aq) 100 cc HOT

134 cc added with stirring during an hour

digest 70-80°C 2 hours

8 liters cold water

0.23 N. 10 liters (sol added slowly to this NH_4OH)

settle overnight

supernatant liquor — off — siphon off

liquor — off — filter

Al oxide
Cr oxide
filter cake
gel catalyst

Al oxide
Cr oxide
filter cake
gel catalyst of Ex. VI

break into pieces

8 days — dry in air 50-60°C

20-40 mesh — crush

Al oxide
Cr oxide
gel catalyst
20-40 mesh

Catalyst Tube — heat gradually 3 hrs. until temp. 550°C — H_2 atmosphere

Catalyst C

Catalyst D is made in the same way as catalyst C except that the 10 liters of 0.23N. NH_4OH is added to the diluted sol instead of vice versa.

SUITABLE METAL SALTS

Salts (of monobasic acids) capable of producing gelatinous hydroxides or hydrous oxides.

EXAMPLES: Salts containing the polyvalent metals

Al	Ni	rare-earth metals
Be	Rh	including
Cr	Th	Ce
Fe	U	Pr
Cu	V	Nm
La	Zn	Yt
Mg	Zr	Hf
Mn		Ta, etc.

Hydrated salts:

nonahydrates of
$Al(NO_3)_3$
$Cr(NO_3)_3$
$Fe(NO_3)_3$

hexahydrates of
$Ce(NO_3)_2$ $Mn(NO_3)_2$
$Co(NO_3)_2$ $Ni(NO_3)_2$
$Cu(NO_3)_2$ $U(NO_3)_2O_2$
$FeCl_3$ $Zn(NO_3)_2$
$Fe(NO_3)_3$ Nitrates of many
$La(NO_3)_3$ of the rare-earth
$Mg(NO_3)_2$ metals

Other meltable hydrates of salts of monobasic acids and polyvalent metals

THE ALKALIES

NH_4OH is best.

May also use other soluble alkalies that form volatile salts, such as lower boiling and soluble amines, or alkyl-substituted ammonias

Any alkali metal hydroxide may be used when the presence in the catalyst of small amts of adsorbed alkali metal salts can be tolerated.

But ordinarily the alkali metal hydroxides are avoided.

Preferably use same alkali precipitant in first and second stage.

DEHYDROGENATION OF iso-BUTANE

iso-BUTANE

Catalyst A — 1 atm. 2000 vol./vol./hr. 445°C

Iso-BUTYLENES

Catalyst B made in the same way as Catalyst A, except that the 0.066M NH_4OH is added slowly with stirring to the diluted sol instead of vice versa.

Conversion of isobutane to isobutylene by catalyst A is consistently 8 % greater than conversion effected by catalyst B.

DEHYDROGENATION OF n-BUTANE

n-BUTANE

Catalyst C — 1000 vol./vol./hr. 550-640°C. Constant conversion of 30%

BUTYLENES

Catalyst C good for 405 minutes, as compared to catalyst D, good for only 180 minutes.

Figure 10

BY

INVENTOR.

information display of the sort discussed above is an immediate need, and will facilitate encoding for such mechanical or electronic information retrieval, while it is being worked upon and when it has been perfected.

The actual path by which information display, of the kind suggested, will come about is more likely in the reverse order—that is, R & D will use it to facilitate its encoding and then make its results available. In so doing this, a body of experience will be accumulated as guidance in directing the Patent Office's "external staff" (referred to above) in how to execute the information displays.

Abstracts

We mentioned at the start that a suggestion will be made that the chemical abstract services could use the drawings of patents such as those of Webber, Silver, Rogers and Douglas, and of the tetracycline patent, as the *complete* abstract of each patent, without requiring any abstractor's service.

As we spread these drawings out before us we can see that they are in fact *abstracts*, but a special kind of abstracts. They are selective intensity abstracts, if you will. Consider the tetracycline drawing (sheet one). The non-initiate might object that the drawing "shows too much" and he would "just as soon read the specification." The answer of course, is that when he reads the specification, the material he reads will mean nothing until he relates each part of it to the particular portion of the multi-step process involved. But the drawing has already done this and has set such material next to the "primary feature" to which it relates. The "selective intensity" terminology arises from the fact that the one viewing the drawing immediately directs his attention to the heavy skeleton outline displaying starting materials, attacking chemicals in the sequence applied, final product and intermediate products. These have been called the "primary features" and are the first rank of the intensity of abstract. From these, the viewer can determine either that he is not interested any further in this document, in which case he need look no deeper into it, or that he is interested further in the document. In the latter case, he can view the document in its second rank of intensity of abstracting, by considering the details of information grouped about each of the primary features to which they relate, what we have previously termed the "secondary features." In other words, the abstract is made in such form that the reader selects the intensity with which he wishes to pursue the abstract, having a positive guidance device (the primary features) which directs him to drop the document at this stage or to pursue it further.

The Official Gazette of the U.S. Patent Office provides a preview of what these drawings would look like if used in the abstract services. I have a number of pages from the Official Gazette, having these drawings on a reduced scale.

I also have here for inspection an abstract of this sort which I made in 1955. It is fitted into a column of Chemical Abstracts, over the single paragraph abstract, and contains the same information, but in the display form herein advocated. Although it is slightly longer than the solid paragraph under it, it is essentially the same size and could have been crowded a little vertically. This sample was made up to provide a direct comparison in form.

On Claims

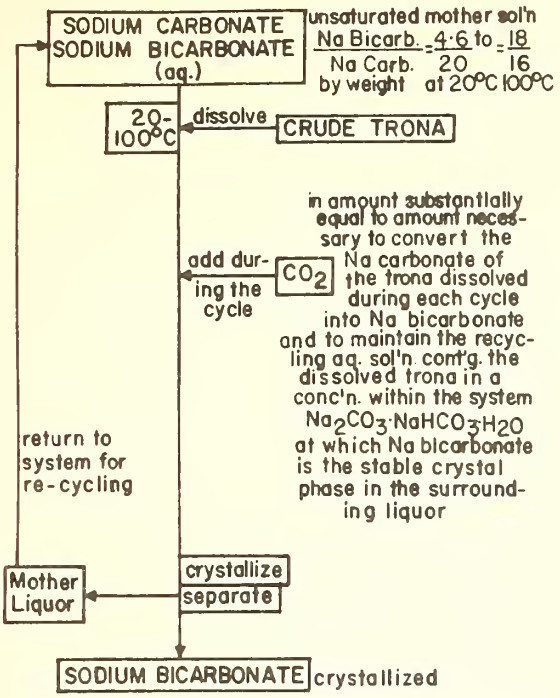
I have another item on information display which I will circulate. Here it is. Interest in it is revived by the recent notice in the Official Gazette (770 O.G. 417; September 19, 1961) suggesting the use and printing of claims in tabular form. This item was also made in 1955. It is a proposed publication, and is concerned with putting chemical process claims in the advocated single standard form of display. I have personally done much with claims in this form, and have found such use extremely beneficial in examination of patents. One of the contemplated advantages for this publication was the acquainting of patent people with the advantages of casting chemical process claims in this form. One reason for not carrying this publication through to regular use was that it would be doomed to failure if the idea of putting the entire disclosure in such form were adopted, since the Official Gazette would then carry such diagram of the entire disclosure, and there would be no need for Official Gazette diagrams of claims. This little gem is entitled the "Chemical Process Companion (Unofficial), to Official Gazette of the United States Patent Office," and is jacketed in the pretty blue paper of the O.G. Three pages from the O.G. Companion showing two possible ways to present the information are shown (Figs. 11, 12 and 13).

Extension of Principles to Mechanical Patents

In the early remarks we stated that there is material in your packets on mechanical patents,

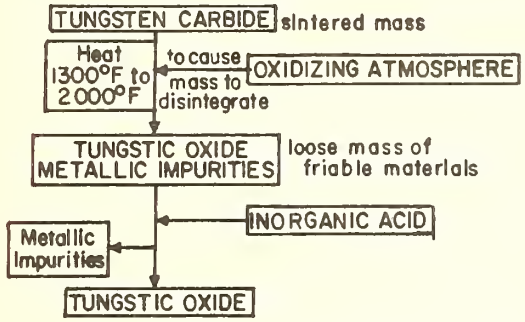
2,704,239

PRODUCTION OF SODIUM BICARBONATE AND SODA ASH FROM TRONA


SODIUM CARBONATE
SODIUM BICARBONATE
(aq.)
unsaturated mother sol'n
Na Bicarb. = 4·6 to = 18
Na Carb. 20 16
by weight at 20°C 100°C
20-100°C
dissolve
CRUDE TRONA
add during the cycle
CO_2
in amount substantially equal to amount necessary to convert the Na carbonate of the trona dissolved during each cycle into Na bicarbonate and to maintain the recycling aq. sol'n. cont'g. the dissolved trona in a conc'n. within the system Na_2CO_3·$NaHCO_3$·H_2O at which Na bicarbonate is the stable crystal phase in the surrounding liquor
return to system for re-cycling
Mother Liquor
crystallize
separate
SODIUM BICARBONATE crystallized

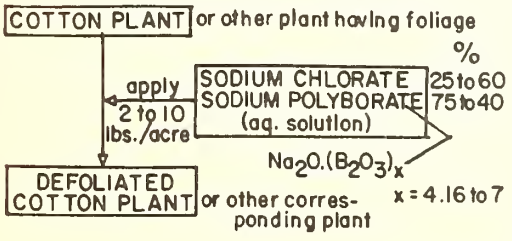
2,704,240

PROCESS OF PREPARING TUNGSTIC OXIDE FROM SINTERED MASSES CONTAINING TUNGSTEN CARBIDE



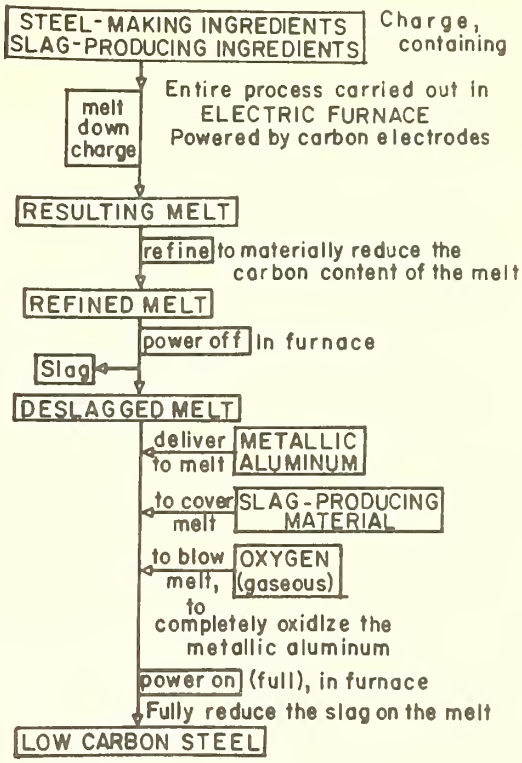
2,704,243

METHOD OF DEFOLIATION



2,704,247

METHOD OF MAKING LOW CARBON STEEL


STEEL-MAKING INGREDIENTS
SLAG-PRODUCING INGREDIENTS
Charge, containing
melt down charge
Entire process carried out in ELECTRIC FURNACE Powered by carbon electrodes
RESULTING MELT
refine to materially reduce the carbon content of the melt
REFINED MELT
power off in furnace
Slag
DESLAGGED MELT
deliver to melt METALLIC ALUMINUM
to cover melt SLAG-PRODUCING MATERIAL
to blow melt, OXYGEN (gaseous) to completely oxidize the metallic aluminum
power on (full), in furnace
Fully reduce the slag on the melt
LOW CARBON STEEL

2,704,248

METHOD OF SEPARATING FERROUS METAL FROM ITS GANGUE

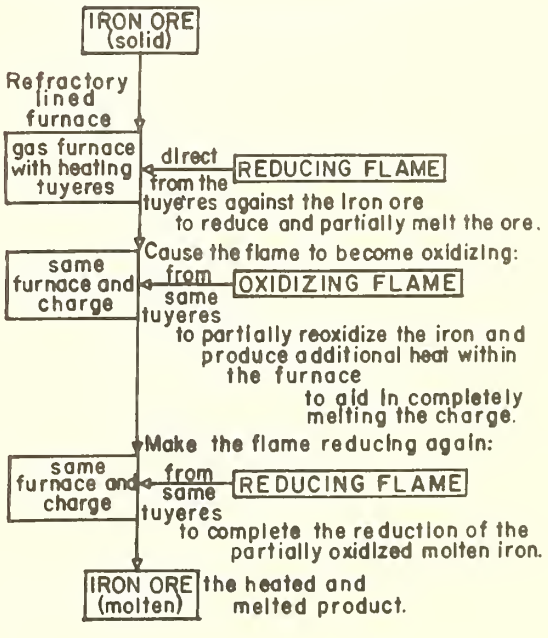
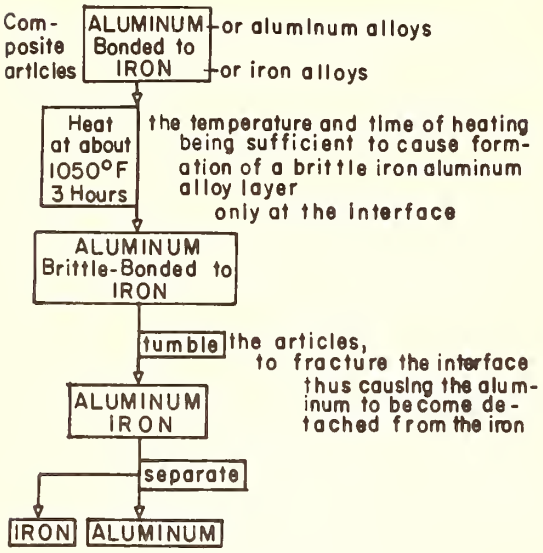

IRON ORE (solid)
Refractory lined furnace
gas furnace with heating tuyeres
direct from the tuyeres
REDUCING FLAME
against the iron ore to reduce and partially melt the ore.
Cause the flame to become oxidizing:
same furnace and charge
from same tuyeres
OXIDIZING FLAME
to partially reoxidize the iron and produce additional heat within the furnace to aid in completely melting the charge.
Make the flame reducing again:
same furnace and charge
from same tuyeres
REDUCING FLAME
to complete the reduction of the partially oxidized molten iron.
IRON ORE (molten)
the heated and melted product.

Figure 11

2,704,249
METHOD FOR SEPARATING COMPOSITE ALUMINUM-IRON ARTICLES


Composite articles
ALUMINUM Bonded to IRON
or aluminum alloys
or iron alloys
Heat at about 1050°F 3 Hours
the temperature and time of heating being sufficient to cause formation of a brittle iron aluminum alloy layer only at the interface
ALUMINUM Brittle-Bonded to IRON
tumble
the articles, to fracture the interface thus causing the aluminum to become detached from the iron
ALUMINUM
IRON
separate
IRON
ALUMINUM

2,704,252
PHOTOMECHANICAL PROCESSES

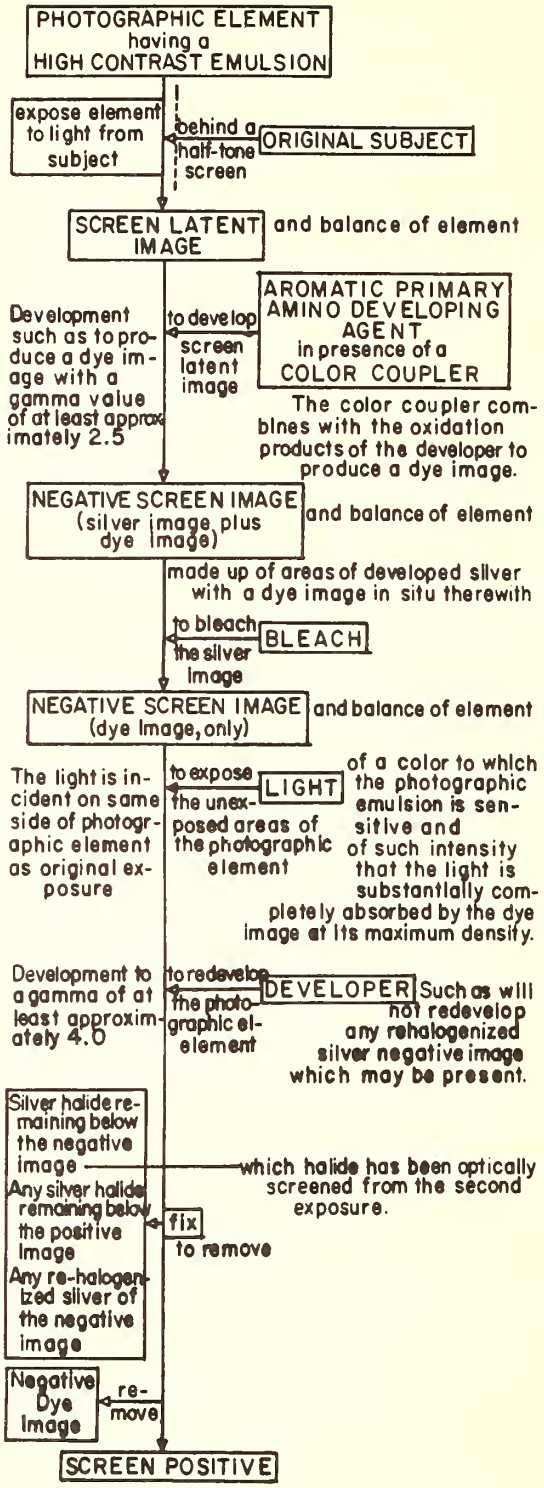

PHOTOGRAPHIC ELEMENT having a HIGH CONTRAST EMULSION
expose element to light from subject
behind a half-tone screen
ORIGINAL SUBJECT
SCREEN LATENT IMAGE
and balance of element
Development such as to produce a dye image with a gamma value of at least approximately 2.5
to develop screen latent image
AROMATIC PRIMARY AMINO DEVELOPING AGENT in presence of a COLOR COUPLER
The color coupler combines with the oxidation products of the developer to produce a dye image.
NEGATIVE SCREEN IMAGE (silver image plus dye image)
and balance of element
made up of areas of developed silver with a dye image in situ therewith
to bleach the silver image
BLEACH
NEGATIVE SCREEN IMAGE (dye image, only)
and balance of element
The light is incident on same side of photographic element as original exposure
to expose the unexposed areas of the photographic element
LIGHT
of a color to which the photographic emulsion is sensitive and of such intensity that the light is substantially completely absorbed by the dye image at its maximum density.
Development to a gamma of at least approximately 4.0
to redevelop the photographic element
DEVELOPER
Such as will not redevelop any rehalogenized silver negative image which may be present.
Silver halide remaining below the negative image
which halide has been optically screened from the second exposure.
Any silver halide remaining below the positive image
Any re-halogenized silver of the negative image
fix
to remove
Negative Dye Image
remove
SCREEN POSITIVE

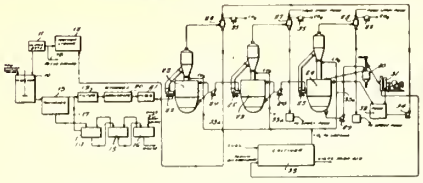
Figure 12

2,704,239

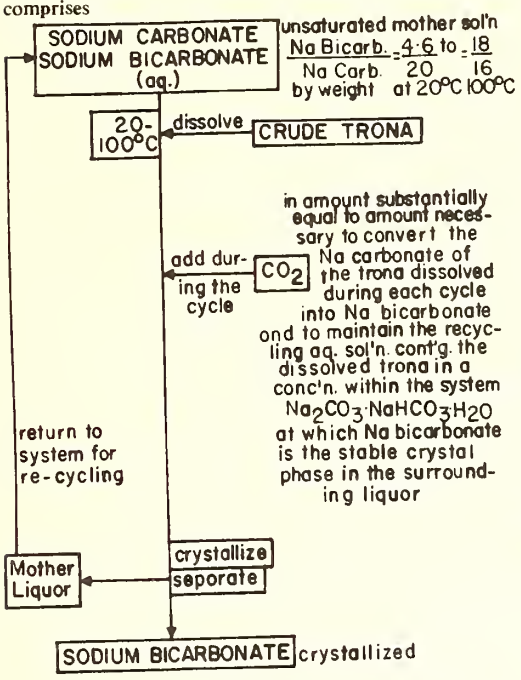
PRODUCTION OF SODIUM BICARBONATE AND SODA ASH FROM TRONA

Robert D. Pike, Greenwich, Conn.

Application June 1, 1951, Serial No. 229,437
10 Claims. (Cl. 23—64)



1. A recycling system for the production of sodium bicarbonate from crude trona by crystallization of sodium bicarbonate from an aqueous solution of trona which comprises


SODIUM CARBONATE SODIUM BICARBONATE (aq.)
unsaturated mother sol'n
Na Bicarb. 4·6 to 18
Na Carb. 20 16
by weight at 20°C 100°C
20-100°C
dissolve
CRUDE TRONA
in amount substantially equal to amount necessary to convert the Na carbonate of the trona dissolved during each cycle into Na bicarbonate and to maintain the recycling aq. sol'n. cont'g. the dissolved trona in a conc'n. within the system $Na_2CO_3 \cdot NaHCO_3 H_2O$ at which Na bicarbonate is the stable crystal phase in the surrounding liquor
add during the cycle
CO_2
return to system for re-cycling
crystallize
seporate
Mother Liquor
SODIUM BICARBONATE crystallized

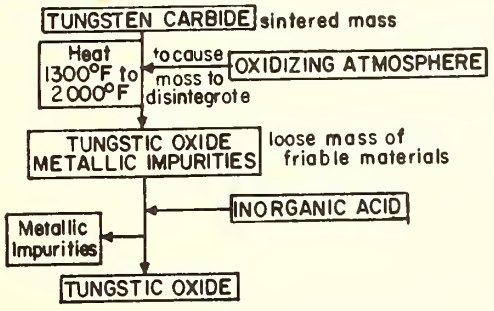
2,704,240

PROCESS OF PREPARING TUNGSTIC OXIDE FROM SINTERED MASSES CONTAINING TUNGSTEN CARBIDE

Howard S. Avery, Mahwah, N. J., assignor to American Brake Shoe Company, New York, N. Y., a corporation of Delaware

Application October 23, 1951, Serial No. 252,760
5 Claims. (Cl. 23—140)

4. A process of recovering tungsten and metallic impurities from a sintered mass of tungsten carbide comprising the steps of



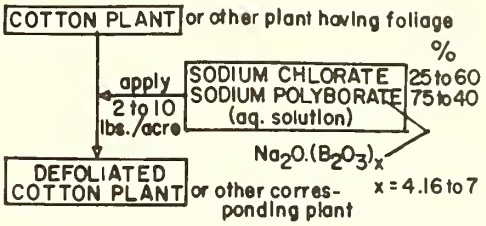
2,704,243

METHOD OF DEFOLIATION

Frank J. Seibert, Bound Brook, N. J., assignor to Chipman Chemical Company, Inc., Bound Brook, N. J., a corporation of New York

No Drawing. Application April 10, 1952, Serial No. 281,662
2 Claims. (Cl. 71—2.2)

1. A method of defoliating cotton and other plants which comprises


COTTON PLANT or other plant having foliage
apply 2 to 10 lbs./acre
SODIUM CHLORATE 25 to 60 %
SODIUM POLYBORATE 75 to 40 %
(aq. solution)
$Na_2O.(B_2O_3)_x$
x = 4.16 to 7
DEFOLIATED COTTON PLANT
or other corresponding plant

2,704,247

METHOD OF MAKING LOW CARBON STEEL

William G. Connor, Tarentum, Pa., assignor to Allegheny Ludlum Steel Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

No Drawing. Application November 13, 1950, Serial No. 195,489
7 Claims. (Cl. 75—12)

1. A method of making low carbon steel, which consists in

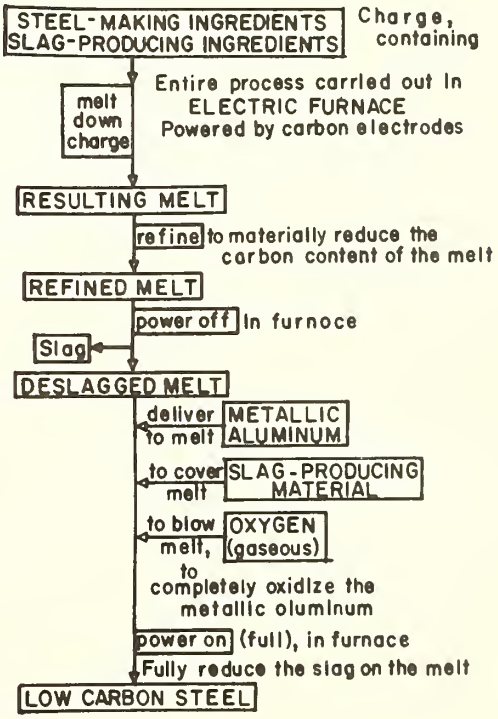

STEEL-MAKING INGREDIENTS SLAG-PRODUCING INGREDIENTS
Charge, containing
melt down charge
Entire process carried out in ELECTRIC FURNACE Powered by carbon electrodes
RESULTING MELT
refine to materially reduce the carbon content of the melt
REFINED MELT
power off in furnace
Slag
DESLAGGED MELT
deliver to melt METALLIC ALUMINUM
to cover melt SLAG-PRODUCING MATERIAL
to blow melt, OXYGEN (gaseous) to completely oxidize the metallic aluminum
power on (full), in furnace
Fully reduce the slag on the melt
LOW CARBON STEEL

Figure 13

March 15, 1949 H. E. VEIT 2,464,622

METHOD OF FORMING RIVETED JOINTS
Filed June 8, 1945

In joining sheet merals, particularly in the aircraft industry, it is customarily practice to dimple depress all rivet holes so as to allow for fitting of the rivet heads flush with the surface of the outside sheet presenting a smooth surface to the air stream.

It is a fairly simple matter torivet dimpled sheets of relatively soft alloys such as those composed of a high percent of aluminum.

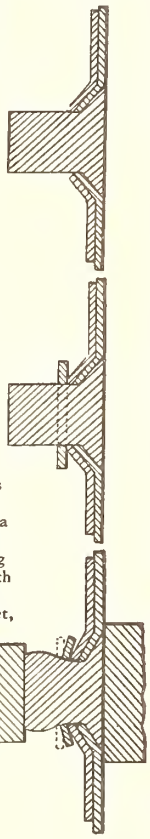
However, in riveting dimpled high strength alloy sheets containing a high percentage of magnesium or similar hard metal alloys there is a tendency for the sheets to crack outwardly around the rivet holes.

Apparently this failure of the metal is due to the lack of ductility of these hard alloy metals and their inability to readily conform to the shape of the expanded shank of the rivet.

especially thin sheets such as 52-SH and particularly in thickness range .020 to .040 inch to be riveted with standard 3/16 inch, and larger diameter rivets.

Sheets of these thicknesses apparently have insufficient strength (tensile) in the metal surrounding the rivet hole to restrain the shank of the rivet as it is expanded during the riveting operation with the result that cracks and fissures are formed in the dimpled area adjacent the rivet.

MAGNESIUM ALLOY SHEETS HAVING NESTED APERTURED CONICAL DIMPLES



Position in said opertures with the shank extended through the opertures and beyond the opex of the bottom sheet and the shoped head seated flush with the outer surface of top sheet

ALUMINUM ALLOY RIVET having a shaped head and a shank portion

Preferred is of currently standard annealed aluminum alloy, known in the art as 56-S, and may be 3/16 inch in diameter.

The present invention provides a method whereby a flat washer of a given ductility is placed around a rivet and in contact with the inner sheet of a plurality of sheets being riveted together so that the strength of the washer is utilized to effect a collar-like action around the rivet, and absorb the excessive force developed in the rivet shank during riveting, expanding gradually to the shape of a cone, hugging the dimple and uniformly distributing the riveting load over a wide area of the dimpled portion of the sheet being riveted.

Place on the shank of the rivet and in contact with the apex of the exposed conical surface of said dimple

FLAT METALLIC WASHER Apertured, having substantially the same flow characteristics as the metal of the rivet

The washer is of aluminum alloy, annealed to the same extent as the rivet, and has an overall diameter less than the maximum outside dimple diameter.

This latter dimension is important in that I have found that the washer gives the best results if less than the size of the dimple area so that when shaped to its final position, the outside periphery of the washer clears the edge of the dimple and does not overlap onto the plane surface of the inner sheet.

This assures a uniform expansion of the shank of the rivet and the washer when subjected to force. Furthermore, use of parts having the same metal alloys obviates the possibility of undesirable galvanic action between the rivet and washer. Also, use of aluminum alloy rivers with magnesium alloy in the combination herein are known to have shown high non-corrosive characteristics under standard corrosion tests conducted by the United States Government.

Apply Aligned force to the shank sufficient to compress and expand said shank to a peor-shaped form outwardly against the aperture of the washer to differentially expand said aperture to change said washer from a flat to a conical shape, and to effect downward movement of the washer against the canical dimples

I have discovered that the expansion of the washer outwardly from the center aperture thereof effected by the expansion of the rivet shank acts to progressively cup the washer to the shape and contour of the dimple.

This action results in a uniform gripping of the dimpled areas of the sheets under compression.

Apply Further force to the shank so as to form a second rivet head therean, having an overlap of less than one-half the radial width of said washer

RIVETED MAGNESIUM ALLOY SHEETS

Edges of dimpled rivet holes protected against cracking and breaking when riveted together
Galvanic action diminished
High non-corrosive characteristics

Figure 14

Oct. 23, 1956 H. E. B. SCOTT 2,767,529

DOCTORS

Filed Dec. 14, 1954

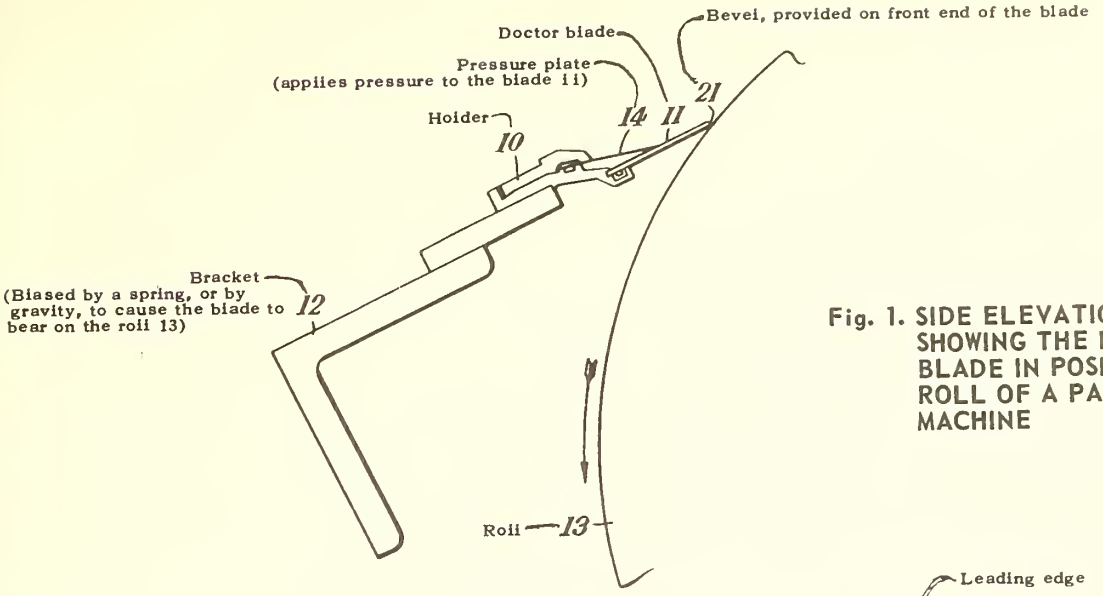


Fig. 1. SIDE ELEVATION SHOWING THE DOCTOR BLADE IN POSITION ON A ROLL OF A PAPER MAKING MACHINE

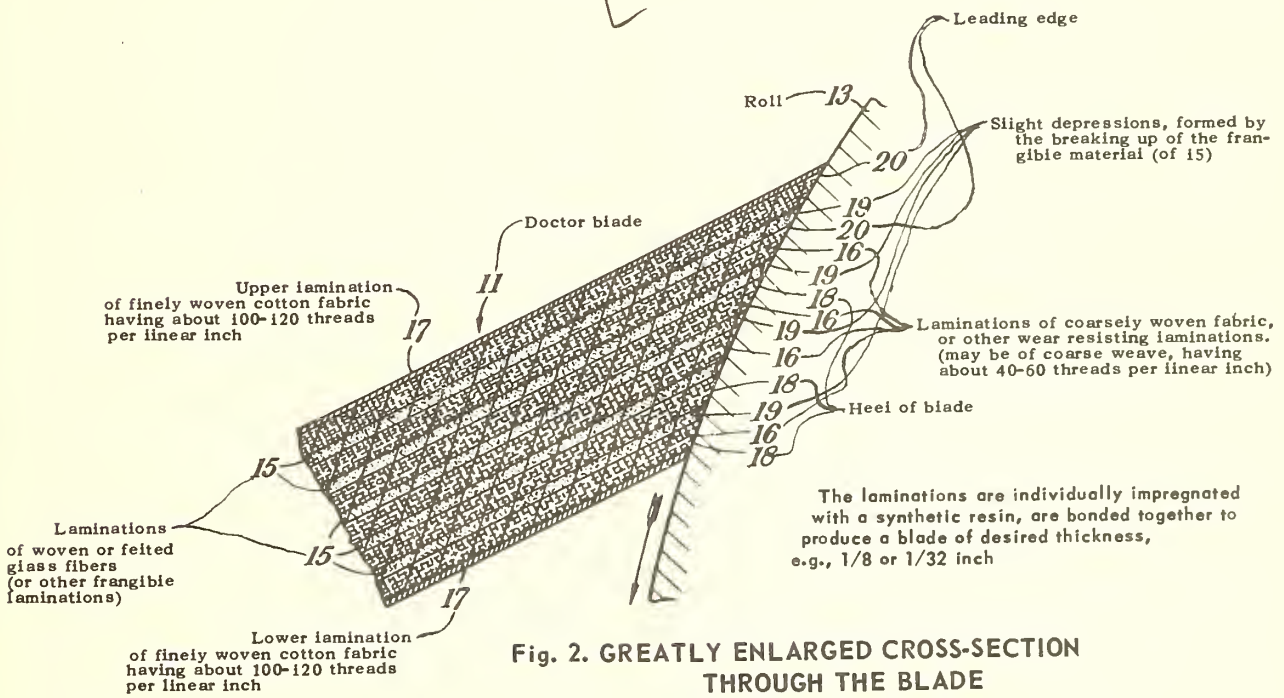

Leading edge
Roll
13
Slight depressions, formed by the breaking up of the frangible material (of 15)
20
19
20
16
19
18
19
16
16
18
19
16
18
Doctor blade
11
Upper lamination of finely woven cotton fabric having about 100-120 threads per linear inch
17
Laminations of coarsely woven fabric, or other wear resisting laminations. (may be of coarse weave, having about 40-60 threads per linear inch)
Heel of blade
15
Laminations of woven or felted glass fibers (or other frangible laminations)
15
17
Lower lamination of finely woven cotton fabric having about 100-120 threads per linear inch
The laminations are individually impregnated with a synthetic resin, are bonded together to produce a blade of desired thickness, e.g., 1/8 or 1/32 inch

Fig. 2. GREATLY ENLARGED CROSS-SECTION THROUGH THE BLADE

Harold E. B. Scott,
INVENTOR

By: Ross C Hurray
ATT'Y.

Figure 15

wherein we applied the principles learned in working with chemical patents, or serving as a basis for the results arrived at in working with chemical patents. As to the latter, we have in mind the principle that the drawing in a patent case should make it unnecessary to refer to the specification, or delay as long as possible such necessity to refer to the specification to understand the drawing. We would set as the aim of the drawing in a machine case, the principle that it should be so well marked with legends that it is unnecessary to refer to the specification at all to understand the drawing and the invention. Just as in chemical patents we have recommended the putting of all detailed information relating to a given point of a process, at that point of the overall process, so would we seek in a mechanical process case to do the same, where the process lends itself to such display. See the work in your folder on the Veit patent which describes a method of forming riveted joints (Fig. 14). The other possibility is shown in the Scott patent on a doctor roll (Fig. 15) where all the description of the specification relating to number designations of the parts shown in the drawing are to be placed right on the drawing, as well as explanatory matter not designated by part-number legends. In an appropriate case, a combination of both displays might be called for.

Tentative conclusions, mainly on the basis of the work on the Morton patent, but also on the basis of the Scott patent and other patents, were reached as follows:

Machine patent drawings display numerical legends designating parts referred to in the body of the text of the specification. The numbers so used are required to be displayed so that they are free and clear of structure and require a lead line to the part designated. Being thus free and clear, they are fair game for attaching another lead line to terminate in the textual matter of the specification referring to a designated part. This textual matter should be put directly on the sheet of drawing, at nearby clear spaces. In a more complicated case, the new lead line and textual matter could be in the form of a transparent overlay. Overlays involve problems which are avoided by direct application of information to the main sheet, so that the latter would usually be preferred.

The textual matter would be clear of the machine as drawn. Only the new lead lines from the textual matter to the part number would run across some part of the drawing for part numbers not outside the drawing. Lead lines, as used up to now, have been beneficial and necessary. The additional lead lines and proposed textual legends would seem to be in the same category.

Expressing this as a laboratory or workshop problem, we could phrase it as follows:

Object: To comprehend in the shortest time possible the teachings of the patent disclosure, down to the finest detail shown, particularly for machine patents.

Method: Have as a permanent part of the drawing, (or less preferred, as a readily available accessory, as by a transparent overlay) legends from the specification, describing the parts designated by the numerical legends and describing relationships of operation.

Reason: Each reader, in one manner or another, fixes the relationship of each of the components of the drawing to the disclosure of the specification relating thereto, preliminary to comprehension.

By placing this on the drawing as it issues, a permanent saving in time is effected by being built into the patents, the saving being effected each time the patent is picked up for first reading, particularly, and each time thereafter for each individual reader.

Broadening the Base

To lay the basis for broadening the treatment of chemical process patents or other chemical process documents, to include at least some mechanical processes, we will first very briefly review our treatment of the chemical documents. This is how it was summarized in the tetracyline reprint on page 381:

"The main purpose was to engineer patents . . . to enable the placing in accessible form of all the details of art in each patent." The single standard pattern therein disclosed and proven universal for all chemical processes was selected as the means for reaching the stated goals. This may be stated in brief as involving the specially defined terms "primary features" and their position in the "master pattern" or "standardized pattern," as shown by Fig. 16a.

The "secondary details" are all the data other than the "primary features," and include the alternatives, if any for the primary features, the physical treatments, data for the particular chemical, such as concentration, pH and temperature.

These secondary details are gleaned from the patent disclosure and placed on the flow sheet drawing at the primary feature to which they pertain.

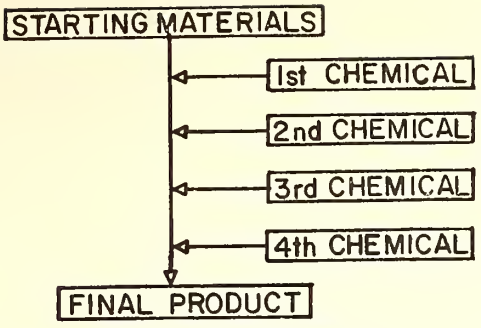


Figure 16a

The prior articles also recognize the aid which intermediate condition identification could give, and note many of the prior drawings for this.

Having thus reviewed the past treatment, we proceed to the broader treatment as follows:

The Module of Process Information

A chemical or mechanical process or method involves the change or transformation of a starting material produced by subjecting the starting material to the presence or action of another material or of a force. The process may involve change of constitution, condition, association, position or shape of the starting material. In all of these, except association in a mechanical sense (which might be called "assembly") and change of position, a transformation of the starting material is involved. The transformation may be chemical, as in change of constitution, or it may be physical, as in change of condition (or state) or shape. Changes in association may be regarded under some circumstances as chemical transformation, as for instance in a formation of a complex or "association" compound.

The common thread discernible in a process, whether it be chemical or mechanical, is the existence of a starting material, a contacting or influencing material or force, and an end product. This makes it possible to diagram processes of such kinds by a common pattern.

We shall call the diagram illustrating a single step process a "module of process information," since it may be regarded as the unit for analysis of any process (Fig. 16b). Every complex or multi-step process may be reduced to a succession of such modules, the end product of the first module being the starting product of the second module, and so on, until the final product of the multi-step process is reached (Fig. 16c).

As in the previous treatment of chemical process patents, we would place next to the "primary features" of the modular process information, the "secondary details", that is, we would place next to each box of the module, all the details of the disclosure pertaining to such box. We have attempted to do this for the Veit patents (Fig. 14).

Conclusion

Patents recast in the forms urged will infinitely aid manual searching (which may always be with us), do-it-yourself punchcard encoding (such as McBee Keysort and Peek-A-Boo, which should be encouraged) encoding for the big job and comprehension of the contents of the patents.

In conclusion, I would like to say that we know that there is concern for the preservation of the patent systems as systems of *examination,* prior to issuance of the patent. It is fitting to observe this now, since we are celebrating the 125th Anniversary of the setting up of the U.S. Patent Examination System. The sorry state into which patents had fallen due to issuance in a registration system is described in an article by Mr. Rosa entitled "Patent Office Organization," J.P.O.S., June 1949, Vol. XXXI, No. 6, pages 414–448.

If we make of patents, documents in which comprehension has been facilitated, we are helping to preserve the patent examination system, since we are helping examination both timewise and qualitywise.

Dr. Davis: Thank you, Mr. Wolk. As I understand it, you are really talking about a new literary form. I am not sure it is going to be as popular as "Ulysses" was, or some of the other experiments in literary form, but it certainly is an interesting development, and I am sure you want to discuss it. Is there discussion of this paper?

Mr. Jancin: I think there is a great deal to be said for this approach, and it probably could apply to systems inventions in block diagram form. However, we found that many overseas patent offices object to the use of legends, and I really do not know why. So I would like to direct my question to this board right here. I am talking of the use of legends as are shown with the various blocks on the patent sheet.

Mr. Simons: Could I say, speaking for the Canadian Patent Office, we try to have blocks labeled with not only the designation, but particularly the

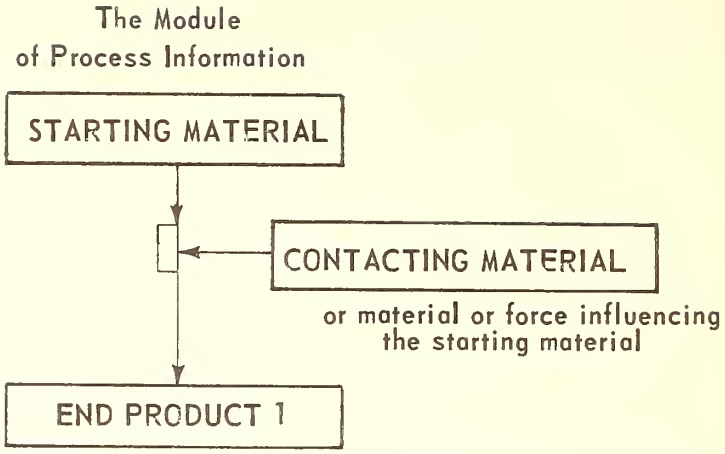


Figure 16b

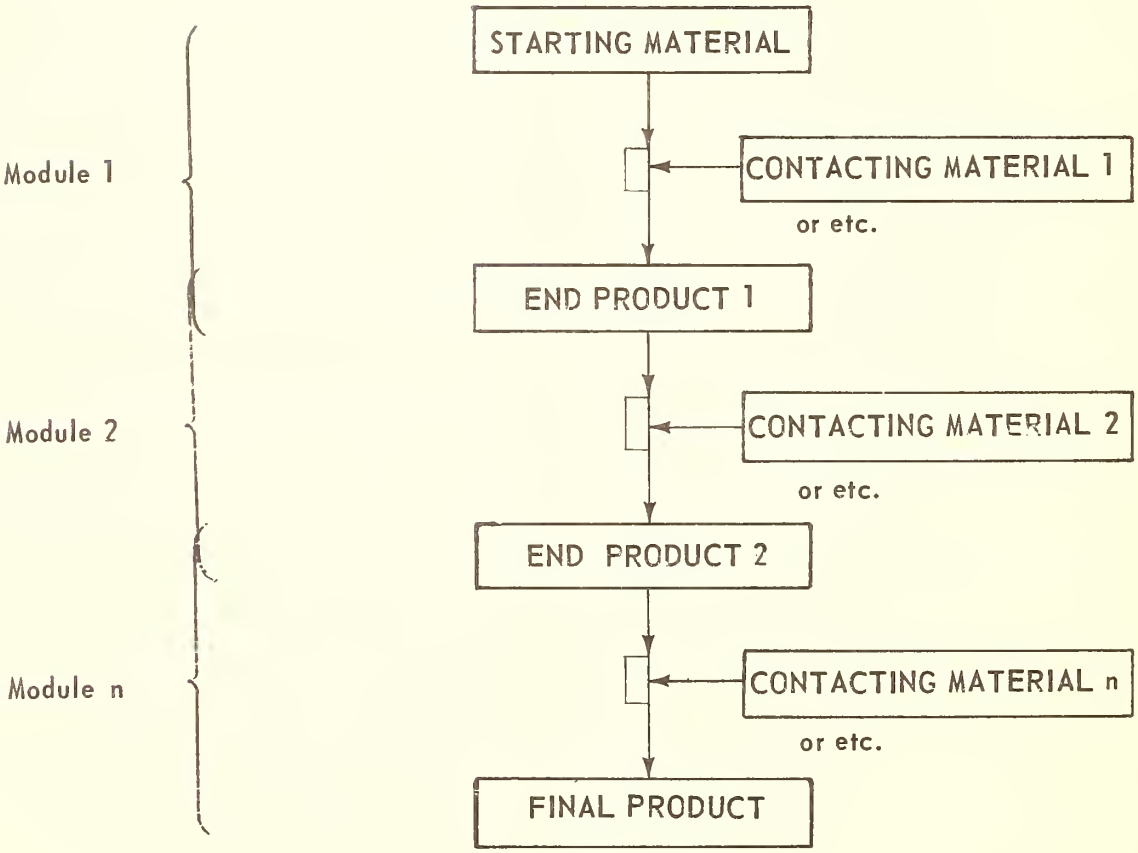


Figure 16c

terminology, so there would not be any trouble in our country.

Dr. de Haan: It is not that we do not allow the use of legends but we cannot oblige the attorneys to use them under our rules. And in general we do not like to have non-uniformity in the practice. With our new law we will have new rules which will probably go in this direction.

(In response to questions from Mr. O'Day, Mr. Wolk stated that he could not estimate the time it would take a trained analyst to prepare the information in a patent according to his scheme and that he had used this procedure on chemical information dealing with large, variable structures such as Markush formulations.)

Dr. Tate: It was suggested that this might be useful to services such as Chemical Abstracts to simplify the process of getting the material into the secondary journal more promptly. Two things in this regard: One is that there are two types of services involved. One is an alerting service for the general public in which you want to get the information across promptly. The other is a retrospective search tool with which chemical abstracts is largely concerned at the moment. This type of flow diagram does not seem to suit either purpose for our general public, first, because it's quite expensive to produce. If you are going to produce a sheet of this size, it is going to be very expensive to get it out and get it out promptly. Second, it has much too much detail for most retrospective searching, because you wish to get back to the original document. You do not want to use the journal itself as a stored document. And the result is that this would be a great help to us, but it would be a help in that we could use a lower degree of training in the person doing the abstracting, to give us a document which we could then use to publish.

Mr. Wolk: You say you would use a person of a lower degree of training. The point is you do not need to use anyone of any training. You just need a printer to print the diagram, which you can find in the O.G., assuming that the O.G. prints them more legibly. And I cannot see why it would not satisfy the alerting service. It gives you the starting material, the end material, and what goes in. What more do you need in alerting? As for a retrospective search tool, it has all the information of the patent. It has the concept of ranking of information and of variable intensity abstracting. I do not see why it would not serve as a retrospective search tool. I think it serves both purposes. And as for the sheet size being too large, I intentionally passed the O.G. around to give you an idea of the size it would be. You can get about four of these on one sheet. And if you saw the sample of the Chemical Abstract that I did there, we have a diagram about the size of the printed block paragraph. Why is that too large? I could compress that a little more and get it to the same size. I think it is an unduly harsh test that something that presents the information in better form, occupy exactly the same or less space than a solid block print in the same size of print.

Dr. Tate: I am not objecting to the amount of space or the amount of information you give. I am objecting to the amount of information which is given for the purpose to which it is to be put. For your purpose, it certainly serves admirably perhaps. For ours, it does not. We do not want to have a stored document printed as an abstract.

Mr. Rotkin: I would like to pursue that just one step further. Why don't you want to have the source document as the abstract if, in fact, it is in such form that there is no need to abstract? I am assuming that there is no need to abstract. But if you have it, particularly if there is going to be any use of microfilm technique, because of the volume of material and the space involved, this would be ideal.

Dr. Tate: You are speaking about something in the future, and I am speaking about something that is now present. We are not speaking of microfilm techniques for the journal as it is now constituted. We are speaking about what it is going to be in five years, and this is a different question. I am not prepared to speak for that.

(Mr. Freudenberg, President of the Patent Lawyers Club, announced that Mr. Kalikow would address the organization that evening on the subject of a long-range program for mechanical searching and extended an invitation to the Workshop participants to attend.)

Dr. Davis: Our next paper is by a person whom you have met already, Harold Pfeffer. But I had better tell you that he is a patent research specialist. He is a chemist and an attorney. He has been with the Patent Office since 1939 as examiner, classifier and as a member of the staff of Research and Development. He is going to talk about the problems in the analysis of patents.

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Mr. Pfeffer: Mr. Moderator, ladies and gentlemen, Mr. Wolk was kind enough to refer to my encouraging remarks with respect to his work. This is true. For those of us who have had the difficult task of trying to analyze the information in a patent document, we all realize the need to reform the information into a concise type of format, such as he has illustrated here. However, I hope that he is going to forgive me for what I am about to say. My talk today is not an offer of any suggestion for international cooperation. But it is intended to point out the pitfalls and the difficulties of analysis as performed by human beings, and the great need for greater use of machines in this area. I am afraid that the remarks that I will make here will stand as a sort of guardian angel with a flaming sword or perhaps as a demon with a pitchfork, in front of the entrance to the hall of mechanized information retrieval. And in order to get in there, you will have to get by these remarks.

In recent years, our investigations in mechanized information storage and retrieval have centered largely on organizing systems which are based upon various search strategies. Comparatively little time and effort has been expended on the input side of the systems—namely, the analysis of the documents, to determine their information content and to prepare them for the subsequent step of extracting some or all of the information content, prior to transforming it into a machine acceptable form. The state of the art, of the information retrieval problem, is such, that we are in no position at this time to belittle the importance of any area of investigation. However, in the total picture, the problems of analysis and extraction of information content are far greater than those of systems design. As far as systems design is concerned, we can always determine the desired characteristics of the systems. We can formulate an orderly procedure and subsequently determine what the necessary hardware should be that could perform the necessary task. If the hardware is not available, we can always determine again whether existing devices can readily be modified to give the desired result. If this is not possible, we can always go back to the system itself and make appropriate changes to fit the situation. However, with respect to the problems of analysis, we have an entirely different picture. Here we are plunged into the elusive problems of human frailties and the even more elusive problems of human communication and how it is accomplished. We constantly witness the difficulties of communication when people talk to each other face to face. There is always a need to establish a common basis of understanding before ideas can be communicated. This is accomplished very often by the give and take of conversation, gestures, facial expressions, and so on. How much more difficult our problem becomes, when the communicator puts his ideas into the cold, printed text of a document, and then disappears from the scene, leaving other people to attempt to solve the puzzle of what he was trying to say, without being able to ask him to interpret his language.

This report is based upon some general observations of a group of analysts, who are organic chemists and who have been working in the Office of Research and Development, and more specifically, based upon observations of a small group which was working on the HAYSTAQ project.

Since the state of development of the art is such that full reliance must be placed upon human capabilities for a significant analysis in depth, of the information content of documents, the question that arises first is, what kind of people do we need? It becomes apparent almost at once, that the people who are engaged in this type of activity must be skilled in the particular discipline or art with which a selected group of documents deals. Whether the degree of analysis to be performed is as meager as that required by a simple coordinate indexing system or as deep as that required by the most intensive searching operation, the major requirement of the analyst is the ability to recognize a concept, no matter how it is expressed. It is perfectly obvious, I think, that the inability to recognize a concept or the recognition of the wrong concept will result in a loss of information at the initial stage of the operation.

As soon as we begin to talk about skilled people, we immediately come to the problem of cost. The individual, who is charged with making the decision at this point, is faced with a dilemma of choosing between skilled employees at a high cost or employees of lesser skill at a lower cost, with the attendant risk of losing information in the system. We must strike a balance somewhere. This, to a large degree, will depend upon the requirements of the system and its intended use. Ideally, of course, there is no question as to what the choice should be. Everybody strives for the greatest degree of perfection which is permissible under his own circumstances. But we have to face the realities of any situation. And the reality here is that cost becomes an extremely limiting factor. In our own experi-

ence, we had to buy the skills that were available to an extremely low budget. Where we would have liked to have the skill of somebody of the equivalent of a Ph. D., we had to take the skill available to people who were recent college graduates.

An additional factor which complicates the problem, of course, is the time factor. If one begins an operation with employees of relatively low skill, with the hopeful expectation of having the level of their skill raised by on-the-job training, then there is a slow-down in the total productive effort, with a consequent increase in cost. In a crash program, of course, such a situation would be unthinkable. In other situations the time limitations are a little bit more flexible, but they still cannot be ignored.

In a number of projects which we have had in the Patent Office of the United States, the cost of analysis has been variously estimated as between $25 to $35 per document. I would like to caution you at this point, that these figures are based upon experimental systems. Even where the system has been put into operation, it is still of a pilot nature, and is being used as a basis for further study. In the HAYSTAQ project, where analysis in depth is performed, in order to find all the chemical compounds which are disclosed in a document, the average time of analysis, based upon actual elapsed working time, is about five hours. At a salary rate of about $3.00 an hour, this comes to about $15 per document. This, of course, does not take into account the time for coffee breaks, other rest periods, and various delays that are due to the distractions common to any operation where a considerable number of people are involved, which, of course, would raise the cost to a considerable extent. The cost by the time we actually get the information into the system, I would estimate now as being on the order of $80 a document, and these are not complete figures either. We are, however, at this point questioning whether the cost per document is a proper measurement since the size of the document is not necessarily proportional to the amount of pertinent information that it contains. A better measure might be the cost per unit of information, which, of course, will vary again depending upon the determination of what that unit should be. Unfortunately, we do not as yet have figures of this type. So far as the Patent Office operation is concerned it is obvious that the cost can affect us to a large extent. We have heard a good deal this past week about the role of the Patent Office in the national economy. If the Patent system is to remain a potent force in our economy, it must produce a reliable product, and if the cost of that reliable product is exorbitant, I do not see how management can do otherwise than grit its teeth and accept the cost, while it looks for something better.

Now, what about the people who actually do the analysis? What kinds of personalities are required? What restraints are imposed by the nature of the work, on the selection of personnel? The work involves a continuous concentrated reading. I can tell you from my own experience that I would not like to be doing this work for eight hours a day and for five days a week. Under the best conditions, this will lead to many physical and mental tensions and strains. If you add to this the distractions of various external stimuli, the situation becomes even worse. In a period of about two years in the small group of analysts that we have been able to observe, we did from time to time witness mounting tensions exploding into bitter arguments over trivial matters. It also did not take very long before we found several new sets of eyeglasses in the group.

The tension which is inherent in this type of work results in the rapid approach of a state of fatigue. In this state the effects of external stimuli become even more pronounced and lead to a significant increase in errors. I asked a number of the people under my control to observe as closely as possible when they began making errors which they themselves were able to recognize. The critical period appeared to be after about two hours. Of course, what we could not determine from this type of self-examination, was the point where errors began which were not recognizable by the individual doing the observing. At any rate, in an attempt to overcome the fatigue factor, the people were encouraged to take frequent short rests.

I also found that inadequate lighting was a constant source of irritation, if I can judge from the frequency and intensity of the complaints on this point. The absence of a telephone on the desk appeared to be another irritating factor, although I am not sure that correcting this would not have resulted in other problems which would have affected the output. We thought at one time that a great many of the disturbing influences could be eliminated by providing privacy for the analysts. When this was finally achieved, and each analyst was provided with a room, I noted that there was a growing discomfort on their part, and that finally they began to congregate while working. Still, in discussing the

possibility of sharing a room, each one showed resentment at the idea. So it appears that some of these causes of irritation are probably the result of the desire of the individual to acquire some kind of status symbol.

Now these observations are based on a more or less casual, empirical study by an unqualified observer. It appears, that in order to assure a smooth running operation with a minimum of error in the productive output, it will require some kind of controlled, clinical experiments, to determine the desirable personality traits and the physical characteristics of people engaged in this type of work. Experimentation will also be required to determine the causes of fatigue and how to minimize them.

The large number of operations involved in handling data from the time the documents are analyzed up to the last transformation when they are finally stored in whatever medium is selected, is conducive to error-making. While some systems may tolerate errors to a greater extent than others, it is always desirable to reduce their occurrence as far as possible. In most of the operations involved, wherever machines can replace human effort, we find that errors can be minimized. However, the state of the art requires that analysis of documents be performed by human beings today, and probably in the foreseeable future.

In utilizing human effort, one of the ground rules is that you must accept the fact that errors will be made. The errors may be both of omission and commission. They may result from a lack of knowledge of the subject matter or from incorrect interpretation of the text. They may result from fatigue, and from the many diverse distractions to which humans are susceptible. Well, what can we do to minimize errors at this stage? Again I am speaking from the position of one with a relatively small amount of experience, but it would appear that an important factor would be to increase the motivation of the individual to put out a more reliable product, by making working conditions as pleasant as possible, and by setting up some sort of system of reward and recognition of the individual's efforts. How far can we push such an approach? Well, again I will ask how much error can we tolerate in a particular system, and how much is management willing to spend to reduce it?

Another means we have of controlling error is by checking. Where more error can be tolerated, we can use spot checking techniques. Where elimination of error is critical, we have to resort to the unpleasant, slow and costly method of analyzing each document twice, and independently, and then comparing the results and resolving the differences. This is the system we have used in the HAYSTAQ project, and in other Patent Office projects. I have always emphasized to my people and I know that the other project leaders have, too, that accuracy is always more desirable than speed in this type of work, although the speed itself can not be completely overlooked either.

Now up to this point, I have talked about the many factors which influence an analysis operation. Now let us look at the problems of analysis per se. The first determination to be made is the extent of the analysis required by the system. This is accomplished by deciding which set of concepts is critical for the purpose of searching through a given set of documents in order to isolate some sub-group of one or more. As the extent of the analysis increases, the set of concepts to be recognized increases correspondingly. The problem of setting up schedules of terms which will be recognition symbols for these concepts, also becomes more difficult in direct ratio to the increase of the depth of analysis. The problem of choosing a proper set of terms is not as simple as it might appear at first. For example, there is the possibility of a conflict between the choice of an arbitrarily contrived concept, which would make life easier for the system designer and one which reflects the experience of those who are skilled in a particular art. Our experience in the past has been that if a great majority of the concepts used is of the latter category, there is not so much reluctance on the part of the user to accept some of the former. This is something I think my brother classifiers will recognize well, too.

It is also noted here that as the set of concepts increases in size, the sharp delineations among them begin to disappear. We can no longer deal with such things as black and white, but we must be able to identify various shades of gray. As overlapping appears, the problems of hierarchical classification are imposed on the set. The difficulties of attempting to organize a set of concepts to establish their similarities and differences, is well known to classifiers and I will not go into the matter here.

Now, having established the concepts which the analysts are to recognize, the real problems of analysis begin. The difficulties here are largely involved in a correct interpretation of the author's communication, followed by a correct translation on the part of the analyst into a standard set of

symbols which best define the expressed concepts. A number of these have been called to our attention in our own investigation and I will mention them briefly.

One of these difficulties is the change in meaning of certain terms over a period of time. In the group of patents that we dealt with, we had patents going back to 1840 and up to the present time. For example, the term anilido was found in some of the old patents, and this term was used as representing an aniline derivative. In the newer patents and in the present understanding of this term, it is referred to as an acid condensation product of aniline, so that the meaning is entirely different. And here, of course, we have to rely on the experience and the knowledge of the analyst and his awareness of the time at which the document was published, to arrive at the correct interpretation.

An analogous situation is the change in meaning of a term when shifting from one art to another, and this, of course, was mentioned by Mr. Oredsson this morning with reference to the word spring. Now we have another example in the word ring, which also may mean different things to various people. It has different significance to the organic chemist, to the chemical engineer, to the automotive engineer, to the jeweler, to the sportsman. In other situations, the difficulty is caused by the fact that the document may be a translation from another language by one who is unfamiliar with the idiom of the target language. The ambiguities in such a case can sometimes be resolved by a careful perusal of the surrounding text. A correlary situation is one where the same art term has different meanings in the source language and in the target language. For example, many years ago, the word "ether" was used by the French and Germans to express a concept which was defined in English by the term "ester." In documents which were translations from these languages, this term was very often not translated: since there is also a concept defined by the term "ether" in English, the analyst had to examine the text very carefully to determine which of these concepts was really intended. Now the peculiarity of this type of situation is that the analyst must recognize that there is, in fact, an ambiguity before he can even begin to resolve it.

Another area, which has been quite troublesome, is that of the latent or not specifically expressed concept. This has been found quite frequently in the group of chemical documents with which we are working. In describing a chemical synthesis for example, the author sometimes describes the admixing of a plurality of reactants, in a not too clearly expressed time sequence, and then indicates the resultant product. Now, in fact, the process may actually be a plural stage process, with a recoverable product which has been produced at each stage. The analyst must, therefore, rely on his knowledge and experience to determine that there is, in fact, a multi-stage synthesis and must also determine what the recoverable products are, even though they were never mentioned by the author. This quite frequently requires delving into source materials to determine accurately the nature of the reaction and what the products are.

There are also ambiguities resulting from typographical errors. Where these occur in the text, of course, clues for correct interpretation may be found in the surrounding text. Errors of this type may also occur in illustrative drawings or in structural formulas in the field of chemistry. Again it is the job of the analyst to correctly interpret the information.

Another problem is raised by documents where information is incorporated by reference. For example, we have found documents where the author describes a particular process and then says "in place of item "b", I may use any of the compounds which are described in Patent No. so and so, or in the article by X in the Chemische Berichte of the year 1896," and so on. Such references to other documents must be carefully examined to determine whether there is, in fact, an incorporation of information or just a mere incidental referral. And also to determine what subject matter specifically, if any, is to be incorporated.

In some special types of operations, such as those that one finds in the Patent Office, some of these problems become even more aggravated. This is particularly true with respect to the occurrence of error. Because of the great need for reliable patent grants, records which are prepared for Patent Office searching must theoretically be 100 percent free of error. An additional aggravation occurs in problems of interpretation. A Patent Office, after all, presumes to speak with a voice of authority in its decisions relative to the grant of a patent. It, therefore, should not be placed in the embarrassing position of having to reverse an interpretation made by its own employees. This is bad both for public relations and for its own prestige. So, where there are apparent ambiguities, our analysts have been in-

doctrinated to make only such interpretations which appear to be based upon reasonable inferences made from considerations of the total text.

In conclusion, it appears that the problem of analysis is quite critical and is complicated by a large number of factors, which at the moment do not lend themselves to solution by machine techniques. The future of the poor analyst does not look too bright, either. At best, there are the various problems that confront him, as I have enumerated them here. And at the worst, he can look forward to being eventually replaced by some computer-like device. I can only conclude here with the immortal words of Gilbert and Sullivan, that an analyst's lot is not a happy one. Thank you.

Dr. Davis: Any volunteers to be analysts as a result of this?

Dr. De Haan: Mr. Moderator, I think we owe much gratitude to Mr. Pfeffer for what he has brought us this afternoon, for I feel, he has gone down to the root of the question and confronted us with facts. I would like to say that I do not speak on my own authority. I have stated the conclusions to which the classification division, studying automation in my office has come, which is almost exactly the same conclusions to which Mr. Pfeffer has come. So when two ways of thinking converge in such a way, I think, there must be a good deal of correctness in it.

I think it is important that Mr. Pfeffer has stressed that the analysis of documents is the pith and marrow of the whole system and that our greatest worry in arriving at an automatic search system is how to bring the facts and the relations contained in a document into the machine in such a way that we can get an answer if we ask the machine if such facts and such combinations are known. The analysis of documents must be done with the utmost care or machine searching to be a success. It has been mentioned here, and I have heard it from other researchers that they are trying to analyze documents automatically. Perhaps after having settled some preliminary problems of mechanical searching, some time in the future, neurologists will have determined the exact working of our brains so that utilizing their knowledge we may arrive at a more systematic analysis of documents. But at the present, documents are written by each man according to his own character, and the characters differ much and we do not understand them. I quite agree with Mr. Pfeffer that it is impossible to neglect in any way the problems of the analyzers of documents, I think we can only start with what I might call manual analysis of documents, and not try to do it by the frequency of words which recur regularly in a document. I think that is very uncertain if only the reason as printed out by Mr. Pfeffer that words often change in their meaning.

I should like to draw the attention of Mr. Pfeffer to his statement that checking is so difficult. The classification division in my office thinks that perhaps the best way of checking the analysis of documents is to re-search applications already disposed of to see whether the machine will produce a list of the same documents which were cited by the manual searcher, you could deduce therefrom whether the analysis was not quite right .

Mr. Kalikow: I do not think I have ever heard two more eloquent arguments in favor of full text storage of patents. I think the two presentations that you have just heard illustrate the tremendous problems that are involved whenever you begin to do any kind of encoding or abstracting. I might say that I spent nine months doing exactly this, encoding 2,000 patents, after which I came to the conclusion that this would never really work. You must put in the full text of these patents, because you never know which way you want to get that information out. There are many errors of omission and differences of interpretation that the abstractor brings, and this is expensive. I think Mr. Pfeffer pointed this out. But when you add up all the cost of what he is doing and you compare it against the cost perhaps of putting the full text of a limited portion of our file into storage, I think they almost become comparable.

Mr. Pfeffer: I would like to answer Mr. Kalikow on this point. This is not really an argument, but merely a clarification. What we are doing is for an actual operation and what you are suggesting is a further exploration into the idea of utilizing the full text, because actually we do not know how to do it as yet. This is an area for further research that you offer.

Mr. Kalikow: This is precisely what I propose ought to be done. (Mr. Frome suggested that graduate students used as part-time employees would offer a partial solution to the problem of fatigue as related to error making.)

Mr. Frome: We have the problem of analyzing patents today. What Mr. Kalikow suggests may

be the ultimate solution. But what are we going to do for the next five or ten years until it is solved?

Mr. Shera: I would like to take up that point that has just been made. We have had some experience, not with patents, but with other types of abstracting work, using graduate students, we have found, just as you have, that not only is it a very economical way of getting the work done, and a very good way of getting it done, but also the chemists and physicists tell us, it is an excellent form of training and education for the student himself.

I really wanted to address myself to another point. I was a little surprised that Mr. Kalikow would say that here was the best argument for using the complete text. It would seem to me it is just exactly the opposite. It is the best argument against using the complete text, because there is no such thing as a complete text. Someone has said that a book is very like a mirror. A jackass can not look into it and expect to find a wise man looking out. A document says nothing except what we say it says. And I think using the complete text in a machine is going to miss completely, the very point that you brought up in the changes of meanings of words over a period of time. It does not make any difference whether "ester" changes meaning whether it is in an abstract or in the complete text. The problem is still there. Also because of the whole syntactical structure, and the latent element which you mentioned, which does not come out in the text. So there is still, as I can see it, no substitute for a re-working of the thing, so that these elements which you have mentioned come out and are eliminated.

Mr. Kalikow: I do not disagree that by using the full text you still have the problem. But there is a tremendous advantage in utilizing the full text in that the problems then become problems only at one area, namely, that of retrieval. Instead of having problems in the classification or the encoding area, and then also having problems in the retrieval area, you then have transferred all of your problems into one area, namely, the retrieval area. And you do not have the problem of trying to have consistency between the encoder and the retriever.

Mr. Pfeffer: I would like to take issue with Mr. Kalikow on the problem of costs. On the matter of putting the full text into a machine, I think the cost at the moment may be even higher than that of using a human analyst.

Mr. Kalikow: Oh I am sure it is. But I think it is worth the price.

Mr. Lawlor: I think you said that it costs about $80 to get an abstract prepared to feed into the machine. According to my calculations, we could also punch tape or punch cards of a 13 column patent for $80 and then it also is ready to put into a machine. Now actually your costs of $80 are low. And I think that as soon as you get this process speeded up, which it will be, I am sure within two years, the cost of abstracting will exceed by far the cost of recording full text.

Mr. Pfeffer: Of course, we also hope that the research in pattern recognition will come ahead to the point where it will simplify this matter and decrease the costs, too. But the important point here is that even if we could get full text into a machine cheaper we still do not know how to utilize it. Mr. Rockman submitted that the examiners were best suited for analysis work since they had the motivation of using the system and had the knowledge of the art and their own experience upon which to rely. In addition the examiner could perform similar analyses on his pending applications, so that on issue of the patent no further work would be required. Mr. Pfeffer agreed that past experience showed that the examiner who used the system had the greatest motivation for producing a reliable analysis.

Mrs. Marden: I think when we consider having more analysts analyze an increasing body of technical literature, we are beginning the consideration of the problem in the middle. It has been estimated that within about 20 years, the time of all of the world's scientific community will be spent analyzing this increasing body of technical literature. In a way the problem resolves itself then, because there will be nobody to write the reports, notwithstanding the increase in population.

So it seems to me that there are two avenues of escape from this dilemma. One of them, of course, is to have mechanical analysis of all of the technical contents. Even there we cannot escape the intellectual effort of planning systems to have machines do this analysis for us. There is no way out of doing the work. But an even better way is to determine at the source, where the material originates, the kind of format which will enable us to have the information in machinable form. And that is where I think we ought to start consideration of this problem.

Mr. Rotkin: I would like to take off from what Mrs. Marden said. In this sense, there are two problems which have been mixed here. One is the problem of today, the other is the problem of tomorrow—we will have machines tomorrow. I do not know what kind of machines. I do not know how they will work. I do not care. But I do know this. Today the techniques of classification, though they vary from country to country, are all an indispensable tool in the machines of tomorrow. No one has indicated that a good classification technique today will hinder a machine technique tomorrow. On the contrary, it will help. So it seems to me that if we enlarge on the classification effort today, we are helping the machine tomorrow. And what I would like to say with respect to Mr. Pfeffer's remarks, is that at least in the American Patent Office, the technique of shifting from the position of being an encoder today, a classifier tomorrow, a part-time examiner the next day—I don't mean on a daily basis, but for reasonable periods of time—seems to be working out when it is not drowned in the flood of expediency of getting rid of a backlog. In other words, if you try to work at a program where you examine to become familiar with a particular art and problems in that art, and then you study the literature, into the schedule; by the time you are tired of encoding, you go back to another project as an examiner. I think this solution would help today in getting us better classification and provide a working tool for the machine man tomorrow.

Dr. de Haan: I quite agree with the former speaker. I also intended to say that there are two problems which are completely mixed up. And this mixing up may result in an error in the automation of searching. I see the problem thus. You have one problem which is to put the facts contained in the document into the machine. By facts contained in the documents I mean the facts reulting from an analysis of documents in a manner which Mr. Pfeffer pointed out. And the second problem is how to get the facts out of the documents. We, in patent offices, all know that the retrieval of facts from the documents can be done by the examiner. If we retrieved the facts from the documents in this way, I am aware that the experts think that they can bring them into the machine in such a way as to obtain the answers we need for the novelty search. But, as to the automatic retrieval of facts from the documents, up until now I have learned very few things about systems which might lead to such results that we could use them to put the information we want for novelty search into the machines.

Dr. Bigelow: The point I wish to make has been made partly, and perhaps better than I will make it, by the three previous speakers. I would like to say that it seems to me that one ought not to be confused by questions as to the availability of low cost student manpower. This may be a fine asset, in the same sense that having a nice deposit of uranium may be a good asset. But it does not affect the question of how you design equipment depending upon the nuclear properties of uranium. It seems to me that the question that I would expect we will be discussing is what is the best mixture of human effort plus machine effort, which will accomplish the purposes of a patent system. That mixture can be zero machines and all human or it could be some fraction of machines with a differing amount of human error mixed in with it. Now on the one hand it is very difficult for me to understand, as a listener, exactly what the context is by which the one speaker says we should have everything in the document in the machine. On the other hand, it is very difficult for me to understand the context in which another speaker says that we should operate primarily upon the abstract. I can see situations in which both of these statements are true. I do not see exactly which problem or class of problems each person is trying to solve in making an absolute statement of this sort.

Let me go slightly further. It seems to me quite clear that any operation you do upon a document, and this point was made, in fact, by the gentlemen from Western Reserve must be classified as an interpretation. You can put the symbols of the document into punched cards, but you cannot put the intent. There is always an operation of intepretation changes with time and with style. One can go back over scientific literature and find things that the scientific great people of the past said which we did not understand then because they were saying things whose thought context was, say, 20 years ahead of their time, and later on we understand what that person was saying. This is inevitably true. It seems to me, however, that the central problem which we cannot really avoid facing is exactly the problem of considering how to design some sort of mechanical aid to some sort of hypothesized class of human talent to work with it, in such a fashion that the aid in the mechanical system is positive, either measured in terms of per dollar, per

document, or whatever metrics you wish. The crucial point really is to investigate the design or investigate the classification system which will lead to the design of some evolutionary process where the obviously mechanizable features of a patent operation are carried out, and where, for example, the end result is that you will either use lower skills in the final operations or you will use, on the other hand, a smaller amount of time of highly skilled people. Either of these would lead to an improvement in efficiency. I did not notice people mentioning the possibility of using, for instance, very highly skilled examiners operating through the interpretative properties of the machine and some classification system associated with the machine, so as to reduce the number of documents they would have to read by elimination. This seems to me a very important aspect of the problem which cannot be eliminated as part of the process which is being studied.

Therefore, what I would submit is that there either is a case for mechanization or there is not. The question of how to do the mechanization must be found upon a careful examination of certain classes of statistics of present day patent examination use. There must eventually be developed estimates of confidence and reliability in the class of operations which we are trying to do effectively. That is, there must be estimates of how effective and how precise and how close in agreement a given group of patent examiners now are. Then somewhere there must be a price attached to this estimate of error. When a price is attached to this estimate of error, then it is possible to conceive of a machine and conceive of the expected error it will produce on some part of these operations, and the price that it costs you to do that. But without more or less this sort of a framework, it does not seem to me that one can say absolutely that all of the document must be in the machine at a certain level. It does say that for certain classes of situation, you will certainly have to see all the documents. Therefore, the question of how to partition this process off is a free variable for the design of the man-machine system. One does not throw out all the documents, nor does one look at all of them in doing a search for retrieval purposes in all of their context.

There may be cases where you have narrowed the field down to a small subset of documents, and for these, 100 percent reading by a highly skilled person is the only thing which will answer the question. Statistics are needed on these questions. How much time of a patent examiner is spent in extremely careful reading of a small set of documents, compared with how much time he spends on glancing rapidly through classes of documents which he can dismiss by the first, second or third paragraph or a very cursory reading. I, for one, do not know what these distributions look like. It seems to me we ought to be able to get at the data somehow.

Mr. Jeffery: I would like to strike a note of optimism here. In Australia we have been analyzing, encoding and searching patent specifications in 26 different classes since 1946, and we are still relatively sane, I think. And the reason for our alledged sanity is that we soon came to realize that one can overdo an analysis. We came to realize the terriffic resolving power of a few broad descriptions, as you call them. Just to give an example, take the whole civil service of the United States. Let us make a search using four descriptions first of all red hair. Red hair is a broad description, isn't it? But that cuts down the civil service of the United States by about, say, a fourth. Then we have messenger boys—redheaded messenger boys. That cuts it down still further. Ages 16 to 18. In Washington. Now use four descriptors in my search. Each of those is quite broad, and yet I have come down to a fairly reasonable number of items. If you divide a mass of material up into half and then half and half and half, you only need 20 of those operations to reduce that by one millionth. So I think perhaps we have been mislead in our analysis by thinking that we have to represent our document all over again by things we call descriptors. We are trying to describe the document. I think that word descriptor has mislead us. We are not there to describe anything. We are there to retrieve. I would rather have the word retrievor. By that approach we find that we can just use very, very broad terms that are immediately obvious reading through the specification. The analysis is quite rapid. Any specification that has more than about 20 descriptors or terms associated with it is a big one in our way. So that is our point of view. We did start off, of course, by trying to be precise and fine and get the very thing out again, but we soon learned. It just broke down on us, and then we came to this wonderful discovery, of course that 2^{20} equals 1 million. But there we rest and we found it quite successful.

Mr. Fairthorne: A small comment on terminology. The inventor of the term descriptor. Calvin

Mooers, recently remarked it would have been better called a rejector, which supports Mr. Jeffery's very profound remarks, that when you are describing a thing, you are not doing the same as identifying a thing. When you are identifying or describing things, you are not necessarily doing the same as retrieval things. And quite different means are required for all three functions. Description is one thing. Identification is another, and retrieval is another. And the question of descriptors is, in fact, raised very intelligently in terms which now could be put in information retrieval terms, in a footnote of David Hume in his essay on "The Populousness of Ancient Notions," which refers to why certain terms are good descriptors or rejectors and others are not to which I recommend to your attention.

Mr. Koller: I would like to add another one of Mr. Jeffery's hopeful notes to the question raised by Professor Bigelow. It has been recognized that there is a balance, you might say, between the abilities and the work assignments we would like to give to both humans and machines. And we would like to find the best fulcrum point so that we can make the optimum use of the abilities of both. I think Mr. Fairthorne will support the position that in terms of present technologies, the machines are experts at clerical operations. And almost any job that we can define in terms of a routine, repetitive kind of operation, I think we will have to call clerical in this context. What I would like to mention in partial answer to the questions you have raised is that there are some experiments which are underway both in the United States Patent Office and in one commercial organization in Europe, attempting to find this best balancing point, where the job of analysis is being divided so that the human being performs what we can best recognize as being an intellectual operation, and all those clerical parts that are normally done by humans are then shifted over to the machine. Some of these things that are being conceived for the machine in this way are going to be quite tricky to work out and yet we can see that the burden on the human which is going to have to be with us for a long time, can be minimized far beyond the point at which it is now being accomplished. We can talk about that later.

Mr. O'Day: I would like to strike another note of optimism if I may. This time about analysts. I have had personal experience with more than 20 analysts over the past year and a half, who have analyzed in considerable depth in some patents. I find that the good analyst does exist. The person who can work 8 hours a day in great depth and concentrate without too much harmful effect on accuracy and quantity, is an actuality. A nuclear scientist is hard to find. A good examiner is hard to find. This is true also of good analysts, but they do exist.

Dr. Bigelow: I would like to ask Mr. O'Day if he would add to his description that he would like to provide them with good tools.

Mr. O'Day: Yes, they must have good tools.

Dr. Bigelow: And I would like to add the following as sort of a footnote. It seems to me that whereas anybody who tries to imitate a human being with a piece of machinery belongs in a psychiatric institution, that nevertheless it is also true that one ought not to be happy with a situation in which the procedures which an analyst applies are something highly subjective to him. They are, in fact, attributed to him, but to the extent they can be communicated. It is necessary in running an organization of running a large complex of men and machines, to try and get and to try and force into standardized statements, into understandable statements (understandable in the sense that they can be interpreted by the other workers in the field) all of the tools he uses. Some of the remarks which were made, which are interesting and true, I believe, concern the best person to prepare a classification system or to prepare an abstracting system being the man who is going to use it. They are fraught with a certain danger. In the first place I do not see how this man is going to know any more in a strict sense about what he will need ten years from now than his isomorph, some analyst. I question this point. But let us waive that. But even if he did, the difficulty is, as you will find yourself, with a specialized subjective art, and not a science. Therefore the importance of trying, striving constantly to reduce to an attempt at formalization of the various things he is doing when he interprets a document at each stage, must receive special emphasis. As this formalization becomes successful, it automatically follows that he can mechanize part of it, so that one will constantly gnaw away at this problem of what an analyst does and he will constantly move further out to the fringe of uncertainty and a wider spectrum of interpretive acts, the routine acts being constantly taken away from. So

this is the kind of a process which I envision, which it seems to me very crucial to try and prepare for.

Mr. O'Day: We have not always found that examiners are the best analysts. Many times they attempt to read themselves into a patent and say "Well we do not need this. We do not want this." And they will violate our very critical rule in the system.

Mr. Frome: Dr. Bigelow, we have attempted to do exactly what you suggested. In fact, we have reached the point where we use human beings right now for what they can do best. Let us take the relatively simple task of coding and recognizing chemical compounds. A human being reads a document and recognizes a chemical compound. From that point on, the machine can completely take over by means of dictionary look up. That is what is in fact being done today. The only thing we are using the human being for is his associative powers, his ability to read and recognize a chemical compound. From that point on, it is mostly routine and the machine can do that. Now some day we hope that the machine will be able to recognize a chemical compound in the text. But that day seems to be a long time off.

Dr. Bigelow: Is it likely that the definition of a chemical compound will shift in time so that this statement will never become true?

Mr. Frome: That is right.

Dr. de Haan: Mr. Moderator, to verify how difficult the analysis of documents is sometimes, I might tell you a personal experience I had in our Board of Appeals. In the first instance, an application had been rejected on an anteriority, which was almost exactly the same as the inventor's. Then the inventor came in to appeal with a very clever attorney. The attorney proved by analyzing the document completely, sentence by sentence that the author of this anteriority had meant something quite different from what the inventor had meant. But all the same, if you had read this document with normal attention, you would have come to the conclusion that he had said exactly the same thing.

Mr. Stein: I would just like to mention some observations that we have made in connection with the analysts on our electronic research project. We have found that there is, statistically speaking, a great discrepancy between the different analyses which are performed on the same document. And we have also found that the same person will take the same document and analyze it differently on different days. However, we have observed one very interesting phenomenon. That is that the important aspect of each document, the inventive aspect, the heart of each document, the major terms are nearly always analyzed correctly. And it is rather the peripheral terms, the secondary terms, which are sometimes correctly analyzed and sometimes not.

Mr. Frome: A note of caution on that. What you call the heart or the essential things of a patent today may not be so tomorrow. I am talking now about specific instances. In early references to the manufacture of polyethylenes, nobody cared particularly whether titanium was a catalyst or not. And if someone read it, they would pass it over. When Mr. Ziegler came along the emphasis suddenly shifted very greatly and everybody was interested whether there was a titanium catalyst in the patent. So you never know when you analyze a document what will be important today, what will be important in the future.

Mr. Kirsch: I would like to pick up a point that Julian Bigelow just mentioned, that I think needs further emphasis. I would like specifically to propose a type of tax on the examiner, as if his load were not sufficiently difficult already. There exist today in the computer programming profession some fairly sophisticated programming languages which have enormous descriptive detail, and enormous descriptive ability. It is possible within these languages, which are quite formal languages and bear only incidental correspondence to any of the natural languages that we speak to describe extremely complex processes. I do not pretend to know whether these processes, complex as they be, are equivalent in complexity to the type of processes that the examiner or the analyst uses during the analysis stage of patent documents. However, it seems quite plausible that one might undertake to develop sophisticated, descriptive languages with particular utility for patent analysis, and then impose upon the examiner the perhaps minor tax, of devoting a small fraction of his effort to describing how he did what he did when he does it. The net result of this would be something that I think would be rather different not only in magnitude, but in quality, from what we have now namely, the ability of the second examiner performing an examination of a patent, or the second analyst analyzing a patent to have

slightly superior ability to the first analyst. That is to say, it is certainly within the realm of possibility, though I know nothing whatsoever about the degree of practicality of this that one might accumulate analysis experience within a machine and then implement this accumulated experience in the form of a machine aid to the analyst, in such a way that the tremendous efforts that we are proposing to put into a document analysis will result in some accrued benefit to us over a period of time, so that we will get better and better doing something which right now we do as sort of a one-shot, each job handled individually, and unrelated to each previous job.

Mr. Van Waasbergen: One of the gentlemen some minutes ago said that in analyzing certain documents, it is possible to overlook a certain point, because at the moment of the analysis, it has no importance at all. It is quite possible that in the future such a feature becomes highly important. But I do not think that this is a very big advantage. If you make an analysis of a document you do not make it for eternity, you make it for a certain period. It is just the same with the classification systems which are now in use. We all know that the classification systems have to be recognized continually because their starting points were not the starting points we need now.

Mr. Fairthorne: We, of course, always come back to this question of the stability and consistency in the interpretation of the text. The fact that people do agree to some extent (and indeed they do) and that language does work, seems to be due to the fact that you always use a document for two exactly the opposite reasons. One is that it is familiar and the other is that it is novel. No one wants to read anything which is totally familiar, and no one wants to have anything that is totally novel because he cannot understand it. And those two factors are, in fact, the cause of stability over a short term within any particular activity. How to formulate it is another matter. Now, it seems to me (and I had often been observing the chemical abstracts people) that this lack of consistency among trained people is extremely important. It is not secondary. It is the things on which they agree which are the familiar aspects and therefore would be regarded as conflicting with novelty in the patent office sense. Where they do not agree is clearly the novel features of the documents they are dealing with, and, therefore, those features are ones which want to be regarded with considerable attention. Not because they agree on them, but because they do not. And this is not hopeless. It does give some idea as to where the future interpretations are likely to be difficult.

Now it is perfectly true as has been said many times, today and by myself at Princeton last week, and a good many other people, that the obvious thing to do is to cut out all these difficulties of prediction, which is intrinsically impossible, in spite of the statistician. After all the world is not run by little, green, old men running roulette wheels, at least I do not think so. It looks like it. The thing is to get hold of what is written. The only thing that is permanent about documents are marks in it. And you want to get hold of that now and interpret it for present needs rather than say now, what somebody will want in the future. I know all that. But at the moment we do not know how to tell somebody to go to the Library of Congress and look though every book and recognize what we want. Until we can do that, we will just have to abstract. That is that. And also, when we can tell somebody to do that, we still have the job of making a machine to look at that text, and in my personal opinion, that is a bigger job than the intellectual one. I was an engineer once. I was also a computer. So, this question of lack of consistency, so far from being a weakness, is in fact one of the most interesting things because a lack of consistency amongst trained instructors is probably giving a very good clue as to the elements of novelty within your documents.

Dr. Davis: I would not be at all surprised if we are getting to a point of diminishing returns. This has been to me, listening as a non-expert, very fruitful indeed, with significance for the future. Shall we call it a day, gentlemen?

The fourth session was adjourned at 5:00 p.m.

Fifth Session

Wednesday Morning, October 25, 1961

The fifth session was called to order at 9:00 A.M. by Mr. Ezra Glaser with Mr. S. N. Alexander, Chief, Data Processing Systems Division, National Bureau of Standards, Moderator.

Mr. Glaser: I am Ezra Glaser, and I am listed as Moderator. My function this morning is to introduce a different Moderator, who will carry the morning sessions. I will moderate the afternoon sessions. We are also adding another short talk, in the morning, to the program as printed. We are having, after Mr. Lawlor's presentation, a short presentation by Mary Stevens of the Bureau of Standards, who will, very briefly, review the contents of a report she recently finished on the state of the art in machine reading and picture recognition. This is something that came up four or five times yesterday. People were saying, "Well, some day machines might be able to read." Mary will be able to tell us, I think, just how much they can read now and what kind of developments are in the offing. That will be the final item after Dr. Lawlor's presentation this morning.

We are also making a modification of the afternoon session. You will note that there is supposed to be a roundtable discussion and then concluding remarks by Dr. de Haan. Well, there are two changes in that. In the first place, he will make remarks but they will not be concluding. They will start the roundtable discussion. I know a little bit about what he intends to say. I think it would be a big mistake to have him say it and then have everybody go home because that is the point, I think, when you will want to say something. So, the roundtable discussion will follow Dr. de Haan.

I will now introduce the Moderator for the morning session, Mr. Sam Alexander of the National Bureau of Standards. He is the Chief of the Data Processing Systems Division. If I wanted to tell you all of the things he has done in the building of computers and putting them to useful work, it would use up all the time of the first roundtable. Since that looks like a very good roundtable, I will simply rely on you having heard of him before; his notoriety spreads wide. I will turn the meeting over to Sam Alexander, and he will start by conducting the five man roundtable.

Mr. Alexander: Thank you, gentlemen, it is really my pleasure. It is a dubious pleasure, on your part, to have me because I feel that in this area, no matter how much notoriety I have, it is all out of proportion to the requirements of the efforts that all of you are interested in.

I would like to offer a remark to try to put this in the perspective that I think I see it, and I hope some of you will see it that way too. In this field of trying to apply information retrieval to the patent system, we are faced with the situation that probably would correspond to an early stage in our knowledge of childbirth. We have many skilled midwives, and almost no good embryologists available to help us with this task, I believe that the general area of discussion will draw these parallels more sharply for you. The deep understanding of the process, and particularly enough understanding so that mechanization can be fruitful, requires that scientific understanding that we so lack today.

I wish I could offer some words of encouragement with respect to the parallel efforts throughout the scientific community, that might flow in and aid the effort that so many of you would like to see. My feeling is that what is being done is very encouraging, but hardly of the magnitude suitable for the deep and complicated problem that we have to unravel. I am sorry that I have to say at this time, that the situation is that involved and that complex. I hope that in some of the sessions this morning you will at least see that there are the beginnings. I urge all of you, who have a position by which you can possibly push for the creation of this more substantial base in my parallel, the crea-

tion of the embryology necessary to thoroughly understand and build up the process into a useful task, will make use of it.

I hope my remarks will not be interpreted as an effort to belittle what the subsequent speakers are about to say. Far from this. I just wanted to encourage those of you who can help, to recognize that there is much more, and much more support and assistance is needed in this field.

With these opening comments, without specific introduction, since I think most of these gentlemen have had some participation in the program, I would like to call on them for their comments regarding a look at the patent system in operation. The first person to discuss this topic is from Australia, Mr. Cecil N. Jeffrey.

Mr. Jeffrey: Thank you, Mr. Moderator. Good morning, ladies and gentlemen. To continue the metaphor of our Moderator, I would like to say that "downunder" in Australia we have brought forth twenty-six young mechanized searches and I think you may be interested in our experiences.

We have to go back in history—almost to medieval times it seems—to the year 1946 when two of our examiners, Mr. Hogan and Mr. K. B. Petersson, now commissioner, commenced investigating how mechancial aids could be applied to patent searching.

The best machinery avaliable at that time was a Hollerith-keypunch and sorter lent by the Bureau of Census and Statistics. Starting with no previous experience, these gentlemen developed the system wherein one card is allotted to each specification and is punched at fixed hole positions corresponding to elementary concepts (descriptors). The first ten columns of the eighty-column card were reserved for class and document identification, leaving 840 positions including the X and Y positions. (See References.) In these references we use the term "dissective", coined at a time when "descriptor" was not in common use; otherwise I think you will be able to follow the terminology used.

The first class of subject encoded was electronics. In three months, the gentlemen mentioned, analyzed and encoded 2,000 specifications using 450 descriptors; I think you will agree that this was a magnificent effort.

Last night I heard a most interesting talk by Mr. Kalikow at the Patent Lawyers' Club. I was particularly struck by his statement that he uses 475 descriptors to encode the claims of about 6000 patents on electronic subjects—a figure comparable with ours.

About 1947 it occurred to another examiner Mr. P. Purcell, that one could dispense with the sorting machine and arrange one card per descriptor containing holes representing the documents. This you will recognize as the peek-a-boo Batten system. It came as a surprise to find later that this idea had been conceived elsewhere independently. Because of our investment in the sorting machinery and the limited capacity of the 80-column card, the Batten system was not introduced on a working basis, although it has always been in our thoughts and particularly recently as I will explain later.

The obvious increase in speed of searching compared to our previous hierarchical type of card index, justified the experiment and whatever time could be spared was spent on encoding some of the more complex and bulky classes of subject matter. The choice of subjects to be so treated depended somewhat on the enthusiasm of the particular individual for this radical innovation, but generally we were able to select those classes which were active, and which promised an early return on the big investment of man-hours needed for analysis and encoding.

In the course of our work we met all the usual problems and made our share of mistakes. We were fortunate in learning early that descriptors must be chosen from a consideration of the material to be encoded and not pre-selected to satisfy some neat and logical plan. We encountered false drops (referred to in our literature as "phantoms"). In the field of chemistry, these can be troublesome, but in mechanical and electronic arts they are usually immediately recognized. We have also met the temptation to make every precise searches in the hope that the final number of documents selected for inspection will be small in number, and by sometimes painful experience, are learning that a reliable selection is one more broadly sought so that it includes a margin of irrelevant material—the "fail safe" approach.

Our present position is set out in the Table. You will observe there that the number of descriptors is between 300 and 400 for decks of between 500 and 6,000 items. There seems to be no direct proportion between deck size and the number of descriptors for the larger decks. While it is perhaps not surprising that, as mentioned above, Mr. Kalikow and ourselves have independently selected about the same number of descriptors for the sub-

ject matter it is notable that for different types of subject the number of descriptors is comparable. I do not know whether this is coincidental, the working of some undiscovered law, or simply due to the fact that the available positions on the 80-column card is of the order of 800 and we are being constrained to use only half the available hole positions by the realization that we must leave room for future descriptors.

You may also note from the Table that we have a machine search for steroids. This was developed independently of that of our friends, here in the U.S.A. The schedule of descriptors is very similar, but the points of difference will no doubt give rise to some useful discussion between us. This particular group of chemicals is particularly suitable for mechanized searching because it forms a self-contained recognizable group; it is more recent art with no large accumulation of documents, yet it is very active at present. It does not present too large a task and can be undertaken in one intensive burst of effort. We are seeking other groups of subject matter with these characteristics and would be pleased to hear of any others you may find.

One is compelled to sound a warning note by drawing attention to the possibility of bottlenecks occurring when too many classes of material are being searched with one machine. I think we are approaching that difficult situation where one has too much work for one machine and not enough for two. The situation is confused by the erratic incidence of lost time due to machine breakdowns and maintenance and by the increasing use to which the machinery is being put for other purposes of a statistical nature.

This is one of the reasons why our attention is returning to the Batten system which, of course, is not centralized at one expensive set of machinery. This system too, has the advantage of browsability, and enables the examiner to try a succession of questions of varying depth and direction in a short time.

In conclusion, I would like to say that we have been using this mechanized system for a long time and on a variety of subject matter. We have recorded the descriptors used in encoding the specifications and in searching them. This is a lot of data about descriptors. It should be possible to discover the frequencies of use of the various descriptors and perhaps find out why certain ones are more popular than others; these are possible principles of selection of descriptors for certain kinds of subject.

Under the pressure of our common needs, and in the strength of our future cooperation, I feel sure we will find the funds and labour for this fascinating piece of research.

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Mr. Alexander: Thank you, Mr. Jeffrey. I can not resist abusing my position as Moderator, to point out that a large fraction of the American business and government public issue pay checks by punch card and I am sure the phenomena you describe would be catastrophic, if it were as regular as you seem to imply. I think one of the troubles is, that it is difficult to insert the appropriate controls, which they can do in numerical work.

The next discussant comes from the Federal Republic of Germany, Mr. Werner Rubach.

Mr. Rubach: Mr. Moderator, ladies and gentlemen. I will try to give you a short survey of our documentation activities. The incessantly increasing backlog of pending applications having now reached 182,000, has compelled the German Patent Office to consider how the examiners' work could be made easier. When taking first steps in this direction, we had to face the fact that the examiners are very conservative people and do not like a big change in the search procedure, which differs very much from the system in use. Having a very heavy load on their shoulders, and being expected to finally dispose of at least 110 cases a year, it was not found possible for the examiners to spend considerable time in analyzing specifications or other relevant technical literature in such a way, that technical facts of interest in their particular fields could be easily found if needed. In the beginning, our activities were therefore directed toward search examiners who showed a special interest in the building up of documentation in their particular fields.

In our activities we were guided this time by the thought that the examiner should remain independent of any centralized organization (that means documentation center), and that he should be

Australian Patent Office

Mechanical Searching Files—Situation At November 1961

A. SERIAL FILES (I.B.M. 80-column card. Single-column sorter.)

Category	Class or sub-class	Subject matter	File contents (approx)	No. of descriptors
Chemistry (organic).	09.10	Oxygen-containing compounds (excluding heterocyclics and phenols).	1,700	(1)344
	09.12	Steroids	(2)1,200	458
	09.2	Oils, waxes, fats	300	(1)344
	09.3	Hydrocarbons, phenols, peroxides, halo compounds	1,000	(1)344
	09.4	Polymers, essential oils, resins	2,400	340
	09.5	Dyes, tannins, diazo compounds, brightening agents	400	(1)344
	09.60	Nitrogen-containing, heterocyclic (3), organo-metallic, derivatives of inorganic acids.	3,400	312
	09.61	Phosphorus—containing	200	34
	09.62	Phenthiazines, Phenoxazines, Phensilenazines	130	76
	09.8	Metallic cyanides, cyanimides and cyanates. Organic nitriles, cyanates and thiocyanates.	300	(1)344
	09.9	Biological products	800	(1)344
Chemistry (others).	87.1	Drugs, pesticides, etc	3,400	286
	73.1	Coating metal by galvanizing, sheradizing, etc	1,000	160
Electrical	X05.4	Facsimile	300	116
	Y05.4	Television	2,000	464
	X05.5	Pulse techniques	2,600	461
	Y05.5	Radio navigation, radar, antennae	2,300	499
	05.59	Radio systems and circuits (other than X— or Y)	6,600	334
	06.1	Electron discharge devices	5,500	458
	X04.7	Electric control	2,000	(5)366
	Y04.7	Capacitors, resistors	970	(5)366
Mechanical	61.2	Gyroscopic devices	430	155
	64.7	Hot air engines	140	171
	77.1	Locks	980	325
	70.1	Moulding, casting	2,000	333
	90.5	Aviation	2,100	460

B. INVERTED FILES (I.B.M. 80-column card. Batten system.) (These are in experimental or testing stage.)

1. Transistor devices. About 120 term cards developed so far. File will contain about 500 documents.
2. Sub-class 09.62 (see above). This is a concurrent system. The number of term cards and file content is the same as in the serial file.

NOTES:

(1) The one set descriptors used for these six classes.
(2) There may be more than one card per patent specification.
(3) It is proposed to remove heterocyclic compounds to a new sub-class and develop a separate code of descriptors for them. Serial file system will be applied.
(4) This class is also searched by Batten system concurrently.
(5) One set of descriptors.

given a tool which would enable him to have rapid access to any information which might be hidden anywhere in his search files. This tool should be of such a kind, that it could be handled from his place of work. Furthermore, we had to keep in mind that an examiner, on the average, has about 15,000 to 17,000 specifications, including other relevant literature units. We therefore thought that in the beginning, this tool could be a set of hand punched cards. In fact, we use a punched card having thirteen rows of holes. The holes cover only half the space of the cards, so that we can bring in the interesting technical concepts, facts, data or descriptors, in natural language and additionally the most important drawings. Having drawings at his disposal seemed to be important, because in the mechanical engineering field and in chemistry, our examiner is accustomed to look carefully at the drawings.

As to the question of who can do the analysis, we feel in our office that the examiner is the right man to do this. In order to speed up the work, we have given the examiners for his particular purpose, graduate engineers who do the analysis after having been carefully trained by the examiner and having been made familiar with the aspects which are regarded as important in the particular field. Before the analyst can start work, the examiner is expected to set up a list of concepts (descriptors) which in total cover the field on which the examiner is working. By doing this, we hope to avoid the use of technical terms which might not be quite correct or which might not give the correct interpretation of the information in a given specification. We have even tried to engage students for this purpose, but we were not very fortunate with the results. There are examiners too, who do not like to collaborate with the analysts, but who, nevertheless, are interested in building up a card index in the course of time. How can this be done in the most economical way? We think it is reasonable, for the examiner to record the information he gets from a specification or other technical literature which he has considered, when disposing of an application which he is examining.

In the future, the examiners should not be allowed to forget the information they have found when they are acting on particular applications. When applications for similar inventions reach the examiners' desks after a lapse of time, repetition of the same search for novelty must be avoided. If they record the essential information in the literature which has been considered in conducting a particular search for novelty and the information is stored, they will obtain in the course of time, a documentation for retrieval, I might say, as a kind of by-product of their normal work which costs only a little additional time.

As we discovered that the building up of a patent documentation in a reasonably short time takes more effort than the German Patent Office can afford to spend, we have looked for help. This help was given to us by our industry, which is deeply interested in the Patent Office being enabled to do its work properly. An Association for Patent Documentation was formed, which is presided over by three men, two from industry and one from the Patent Office. I have the honor to be the representative of the Patent Office. It is a new organization which is open for everyone and every firm, which is interested in patent documentation. I am very happy to say that even our friends from the Netherlands are represented in our test groups.

The practical work is done in so-called test groups, each of which is active in a different field of technique. Until now, fourteen test groups have been formed. There is one test group which is concerned with equipment and methods for patent documentation. It was decided that in every case, the work had to be started with the setting up of a list of concepts or descriptors. If agreement on a list of concepts, (whose number may vary from under 150 to 2,000) is reached, the members of the test group begin to analyze the relevant literature. For this purpose, a format has been worked out by the Patent Office. The members of the test groups must put the results of each analysis into this format. All completed formats are sent to the Patent Office. The Patent Office is charged with the making of the master hand punched card. From this card, copies are made and are given to all members of the test group.

The German Patent Office is aware that at a later stage, when enough analysis work has been done, we will have to think of using machines for patent documentation purposes. In order to be able to do this at any time, we have already installed new equipment, so that with the hand punched cards, a machine card is delivered which has all information which is contained in the hand punched card. For the time being, the machine cards are only stored, but they are at our disposal, whenever we intend to make use of them.

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One further thing I might state. Until now we did not think that we could abandon the hand punched cards at all. As I pointed out at the beginning, we would like the examiner to be independent of any documentation center. In his own search file, the examiner is expected to make the search by using his set of hand punched cards. But we think that there is good reason for making use of machine cards, in such cases in which the examiner is compelled to ask other examiners for help. We have had very bad experiences in these instances, because the examiners who are asked for help, do not take much care in answering such questions. We think that we will get better results, if in such cases machines are used for providing the answers. To enable us to use machines for such purposes at any given time, we have to create a second set of cards. For this reason, two punched cards are produced each time, one being given to the examiner, the other being given to the documentation center. So you see that our activities in the documentation field are very restricted ones. We regret that due to the heavy load resting on our examiners, we cannot do more. On the other hand, we believe that the examiner is the central figure in our documentation activities. We need him and his help. Therefore, we should try to restrict his collaboration only to those things which he can do best. We will be able to win him to our side, if we avoid doing things which he may regard as being a sort of secret science. We should try to give him a tool which is easily handled, but which gives him rapid access to any information which might be hidden in his search files, when he wants it. As to the search files, we should be careful to collect only such material which is pertinent to a particularly relevant field of technique. For this purpose, we need a classification tool which is keen and efficient.

Mr. Alexander: I am pushing the speakers gently, with the hope that we will have an adequate discussion period. I think I can already see the seeds of vigorous discussion in some of the desires at least, of having both ends of the thing, completeness and on the desk. This I must see. The next speaker is from the Netherlands. Mr. P. van Waasbergen, who represents the International Patent Institute.

Mr. van Waasbergen: Mr. Moderator, ladies and gentlemen, it is with hesitation that I speak here, because what I can tell you is not very important. Nevertheless, I shall try to give you an idea of what is done in a small Institute, but we do not intend to remain small. We are convinced that mechanical searching in the future is an absolute necessity. There are several reasons for this opinion. In the first place, there are economic reasons. In most countries of the western world, there is a shortage of technical staff. Moreover, the quantity of literature with which we have to carry out our searches, grows exponentially and this literature becomes more and more complicated. There are also technical reasons. It is my opinion that in a short time the classic classification system will no longer be adequate, because it does not give sufficient entries into the material. We need more entries and mechanical searching will be a means to help us in the economic field and in the technical field. Because the fact that the Institute is so small, it is at present, absolutely impossible for us to make use of complicated electronic machinery to do our searching. Nevertheless, we are of the opinion that it is necessary to do something.

One of the reasons is a fact which was just mentioned by Mr. Rubach, and that is the attitude of many examiners. It is a curious fact, that many examiners who day after day, have to handle the newest and most modern things, are so conservative that they do not like to change their methods of work. And if at any given moment, new machinery and methods are introduced on a large scale, it will be very difficult to obtain acceptance if the field has not been prepared in advance. We must therefore now make the examiners acquainted with the idea that other methods of search will be necessary. Moreover, we are of the opinion that with very small, very modest means, such as hand-sorted cards, it is possible to get good results. Then there is the last point. So long as we do not have mechanical analysis of documents, it will be necessary that documents be analyzed by men. Then, it does not matter very much, whether the results of this analysis is applied to hand-sorted cards, to machine-sorted cards or to electronic machinery.

However, by making use of very simple systems, we can readily obtain a certain amount of experience in the analysis of documents. It is for this reason that some years ago, a decision was made to carry out some experiments. We discussed this question with the authorities of the Netherlands Patent Office. You probably know that we make use of the same search material. It is of great advantage to us that the Netherlands Patent Office gave us that possibility. It was then decided that the people of the Netherlands Patent Office would work out a system

dealing with carburetors, making use of punched cards, and necessitating the use of a rather sophisticated machine, and that the Institute would carry out a number of experiments with hand-sorted cards, peek-a-boo cards and IBM type punched cards.

The first system we made dealt with electro-luminescence. There are not very many patents on electro-luminescence, but they are extremely disagreeable to search because you have to read them from the first word until the last. It is quite possible that the anteriority (anticipation, Ed.) may be a single word which you find on page three, line thirty-seven, between brackets. So it was necessary to devise a scheme of features which is rather detailed.

The punched card we made use of is a commercially available card which gives us the possibility of describing 762 features. Our system needs about 670 features. The time which is necessary for an analysis of a document was, I believe, between 35 and 40 minutes per patent. That does not say that if you take an average patent, it takes only 35 to 40 minutes to analyze it, because we found that 200 cards referred to 600 patents. That is to say, that there is an average of three corresponding patents to one subject. So the time of analysis has to be multiplied by three.

The practical experiences we had with the system were very good. We tested it by repeating the searches of cases we had already searched manually. All the anteriorities we had found before came out and also some others. Then the decision was taken to go on in this field and the system was enlarged to the whole field of luminescence.

Meanwhile, the examiner who did the work had learned so much about it, that he was able to set up a system which was a bit less complicated. The time of analysis was reduced to between 20 and 25 minutes. I think this is a confirmation of what I said in the beginning, that you must work in the field to learn about it. Just as in learning to swim. You cannot learn swimming by reading books and talking about it. You must go into the water, however disagreeable it is at first. This system for luminescence is not yet entirely ready. But the experience we had with the electro-luminesence was such, that two other examiners came up with a proposal to make an analogous system for the dyeing of textile materials. We now have about twelve hundred cards on the dyeing of textiles, which refer to about 3,000 patents. The field, as you probably know, contains many publications which are very complicated, and we found that the time of analysis was between fifty minutes and two hours. Do not forget that this time has to be multiplied by the factor which indicates how many patents refer to the same subject.

This experience, Mr. Moderator, refers to the normal hand-punched cards. At the same time we set up a system with peek-a-boo cards, to get experience with it. We have made use of a commercially available card, which gives us the possibility of recording 9,000 documents on it. This system refers to laminated materials. Laminated materials, of course is a very broad subject. On one side of it you will find plywood and you could even say that the transistor also is a laminated material. We did not however go that far. Nevertheless, the field we are covering is very broad. The time of analysis varied between 25 and 30 minutes.

I must tell you that in all the things we have done, it was the examiners themselves who did the analysis. We also had the experience that it is absolutely impossible to do this work eight hours a day and five days a week. A man could do that for a week, but then to maintain his peace of mind he had to change over to other work. So what we did, was to give a man normal searching work on applications and a part of this time was utilized for analysis.

Of course when a man found certain anteriorities in his search, that is to say he had read these anteriorities very carefully, he immediately applied his knowledge to make an analysis and to help put it on the cards.

Another experience we had was that we had enormously underestimated the work which must be done between the analysis of the documents and the final card. It is still a bit curious for me that the punching of the cards and controlling of the cards and the writing of the number of the document on the cards takes a lot of time and we have found that a very embarrassing thing.

We have also had some curious experience especially with this system of laminates. We had two examiners working on the same thing, so of course, we made a comparison. The first thing I found out was that one examiner found many more features than the other one. About twice as many. Then we found that they did not always find the same features. This is a question of appreciation and in my opinion this is an extremely difficult point. It is necessary to define the features you are looking at in a very careful way and even if you have done that, then there is always the possiiblity of a difference of interpretation.

Now I want to say this gentleman, that I am not afraid, that I think it is not so bad if at a certain time one or two features are missed, because I am of the opinion that in a normal search there are many more features that are missed. I think that even then, the quality of the mechanical search is still better than that of the hand search.

Another experience we had, for instance in the field of the laminates, is that it is superfluous to analyze all documents, because there is a lot of literature which is practically never consulted. Most of the searches in this field are based upon materials which did not exist before World War II, so we found out that it was more economical not to analyze the old literature and for the few applications, and for the few searches which necessitated the search in the older literature, to apply the old conventional way.

Another experience we had was that you can also go too far with the analysis. I do not think that a system is good, which gives you only the reply yes or no. Because if you put the question into the system and the reply is "No, it is new" it is perhaps a bit paradoxical since you have really learned nothing. Especially in Europe where our claims are worded so that you first give what is already known and then you say what is new, it is not sufficient to know that there is no complete anteriority. It is important to know what is known. In my opinion, therefore, a system of analysis should not go too far. It should give you those publications which come nearest to what you are searching.

Another experience that we have had is that we studied certain subjects in view of mechanization and when we had studied them seriously, it came out that the mechanization was not at all necessary because a simple classification was possible which was much easier and cheaper.

The last system I shall describe is one which we are now building up. We make use of the normal IBM punched cards. For many years, in the Netherlands Patent Office, the searches in the field of regulation were mechanized in a certain way. The documents were analyzed and the features introduced into lists, and the searching was done simply by comparing the indexes on the lists. The disadvantage was that only one search at a certain time could be carried out and moreover that there were many errors made in consulting this list. We are now putting these same features on IBM cards, with the advantage that the search can be carried out much quicker and without errors. Moreover, we have another idea. We are of the opinion that publications relating to regulation are not only important for regulation, they are also important for measuring. If you have a regulating system, you have at first a measuring instrument, and you compare the result of the measurement with the standard, and you do something with the difference. That is the principle of regulation. Now we have found that many anteriorities concerning measurement can be found in the field of regulation. By putting the information we have on the punched cards, it will be possible for us, in a very cheap way to get this information.

Mr. Moderator, these are our experiences and just as I said, I have not very much to tell; it is not very important; nevertheless, for us it is important. We consider our experience as favorable. We are certainly going on and we will try to find other fields where such simple means will be of advantage. Nevertheless, we considered it on the whole as a preparation for the big mechanical search tools which are being developed. I thank you for your attention.

Mr. Alexander: The next person to discuss this topic is from the United Kingdom, Mr. L. F. W. Knight.

Mr. Knight: Mr. Moderator, ladies and gentlemen: whilst I intend to be very brief, I am in a little difficulty in knowing where to begin. Perhaps the right place to begin, in our case, is fifty-six years ago when our search started. Because in the United Kingdom Patent Office, we have always had, since our search started, a system of visual signals, which, I think is unlike any system in any other patent office. The visual signals are clips which are attached to cards, the cards being double foolscap size, and carrying a copy of the printed specification, the drawings of the specification pasted on the cards, the abridgment of the specification and various other aids to searching, apart from the clips themselves. The clips normally occupy the top of the cards and their position and/or their color indicates a feature described in the specification. In many classes, the clips represent features of the disclosure looked at from different viewpoints, or representing different types of feature. Consequently, it is frequently possible, in some classes always possible, to use concept coordination to restrict the search to those cards which carry a specific combination of clips identified either by color or position or both.

Normally, up to 180 different classification units or descriptors may be represented on a single card; and higher levels of classifiification may be represented by color independent of position, or position independent of color. Consequently, far from looking at every specification in the given file, the examiner for the last fifty years, has only needed to look at those cards bearing the appropriate clip combination, thus frequently reducing the number of cards he need look at to a very small number, and in many cases, of course, to zero. If he does have to look at several cards, he may first glance at the abridgment, and this frequently results in his not having to look at the specification itself, even if the card bears the appropriate clip combination.

Thus by visual aids to searching, a British examiner, I venture to suggest, usually needs to look at far fewer specifications than his examiner counterpart doing a normal search in other countries, through a file of equal length. The great disadvantage of this system, of course, is the space it occupies. Probably, for every specification we utilize five times as much space as the space utilized in the American office for the same specification.

Nevertheless, even this amount of searching has been considered irksome, and we have experimented with other systems employing greater degrees of mechanization. In particular, we have carried out several experiments using the Batten or "peak-a-boo" system. An early experiment was undertaken in the field of welding and soldering fluxes. In this case we had a very large number of descriptors and a reasonably large number of specifications. Unfortunately, no sooner had some progress been made in carding our information than the input of patent applications in this file dried up completely, and it has been of little if any use to us. Much more successful experiments have, however, been carried out. In particular, in 1952, we carded on the Batten system, luminescent materials and it is possibly unfortunate that the International Institute and ourselves should have gone into the same field. It might have been far better, I think, had different offices experimented in different fields. But here we have a file of 1,500 specifications coded on the Batten system using forty descriptors. We found that there was an average saving of forty minutes per search, by using the Batten system, compared with our combination clipping system using the same descriptors, but it was found that the system could only usefully be employed in about fifty percent of the searches needed to be made. That, of course, was owing largely to the very restricted number of descriptors used.

Another successful experiment more recently was in the field of packaging, where a far larger number of descriptors was used on a file containing some 6,000 specifications. But again we find that only about half the searches can be made using the Batten system. But where it can be used, the search takes approximately five minutes compared with two hours using our normal clipping system.

A further experiment has been begun in the field of cathode ray tubes and other experiments are envisaged in the very near future in the field of sound recorders and reproducers and in the field of woven materials. Steroids have also been under consideration, but since the United States Office has already adopted a system of mechanical searching of steroids, I should like to have a look at that before we go any further with our suggested Batten system for steroids.

We think very highly of the Batten system and we are going to carry out quite a number of further experiments for we feel that it can be used in a very large number of fields.

Another system with which we have experimented is the use of statistical punched card sorting machines. A very early experiment in this system going back to about 1948, was in the field of alloys, using some 1,600 descriptors. Unfortunately, this experiment foundered because with the apparatus then available, after every seven or so searches it was necessary to reproduce the cards. They just would not stand up to the wear. Consequently, we discontinued that experiment because no other suitable sorting machine was available at the time.

Recently, however, we have had made available to us the use of a computer operating with punched cards and we are now using this for searching in the field of coating with metals, using some 160 descriptors, where we find that although there is a definite saving of search time, the saving is not very great, since we can do very rapid searches in this art using our combination clipping system. Also for purposes of comparison, we have extended the experiment of using the computer to "Packaging" cases, so that we now can search any packaging application either by the computer, by Batten punched cards, or by our combination clip system. But it is too early as yet to assess the result of this experiment.

Finally, we are carrying out an experiment using Findex punched cards, the knitting needle type of

system, in combination with positive microprints mounted on the Findex cards. A positive microprint of every page of the specification, of every drawing, and of the abridgment, is mounted on a single Findex card. This experiment is being carried out in the field of selector and other controlling means of variable speed gearing. There are about 2,500 specifications concerned and we are using 72 descriptors. The experiment has now reached the stage that about 95 percent of the material has been photographed and the punching of the cards and the mounting thereon of the microprints is proceeding rapidly and we hope to have the complete set ready early in the next year. But this experiment is suffering at the moment by our not being able to find a really suitable microcard reader. We can not, therefore, as yet assess the result of this scheme.

In addition, I should point out that the classification of every British patent specification for the past fifty years, is being recorded on punched cards. This is about 97 percent complete at the moment and is due to be completed by the end of the year. This is being done largely for statistical purposes and for the production of file lists corresponding with every classification mark, for sale to the public. The lists as far as we know, are accurate, and are kept up to date. When this system was started some eight years ago, no possibility of using these cards directly for search purposes was envisaged, but we are now looking into the possibility of using them in some way or another: it is however unfortunate that a system whereby the cards could be sorted more readily and in a greater variety of ways was not adopted.

Finally, I would like to agree with Herr Rubach and Mr. van Waasbergen, that one of the principal difficulties we have to overcome in mechanization proposals is the inherent conservatism of patent examiners.

Mr. Alexander: Gentlemen, the coffee pot is bubbling vigorously, and rather than have a strong brew that will irritate tempers and lead to intemperate discussion, I recommend that we have a break in the presentation and have the last presentation after the coffee break and the discussion following.

A short recess was called by the Moderator.

Mr. Alexander: Gentlemen, may we reconvene? We have the last speaker, Mr. Herbert Koller from the U.S. Patent Office, who I believe has not had the opportunity before to participate directly in the proceedings. I would just like to say that he is an active member of the R. and D. group, and in particular has been working on a chemical search program with our people at the National Bureau of Standards in a team effort. His place on the program this morning is to give a review of the retrieval work at the Patent Office. He has kindly agreed to hold his remarks to a rather brief listing of the subjects. The people responsible for these activities are in the room and you are invited to go deeper into the subject during the discussion.

Mr. Koller: We have heard descriptions of various approaches to the problems of mechanization from the several speakers who have preceded me. We have seen a great deal of difference in the approaches that various patent offices have taken to these many problems. I think that we must attribute the differences in approach to the differing philosophies reflected in the patent laws of the various countries. In addition, we have such problems as the relationships between the size of the work load and the size of the professional staff in each office. In general, Mr. van Wassbergen expressed a good deal of the philosophy that has motivated our group in the past, with respect to the things that give rise to the need for mechanization, and with respect to the intensity of need. By way of example, in our Office, we have to adopt the attitude that every detail of every published document, may be of equal value in searching. This is due to various features of our laws. Also, there must be recognized the fact that patent specifications, which form the largest readily available searching material collections, differ in the various countries. For example, in certain of the continental systems, you find that typically a patent specification is restricted almost entirely to one subject, whereas, according to the custom that we follow, we permit great latitude in the scope of the general discussion in the body of the specification, and concentrate most of our efforts in seeing that the claims are tied down very closely in scope to the actual invention. As a result, a single document may cover an enormous range of subjects. Because of the value that is placed on all of the subject matter of any document, we feel that large scale mechanization will require extremely deep analysis and indexing of the subject matter.

The work in the United States Patent Office was briefly reviewed by Commissioner Ladd, and this was supplemented by the remarks of Commissioner Watson on the first day of the meeting, so I will not attempt to go into too much of past history. I would

like to say, though, that at approximately the same time that our friends in Australia were starting to work on these problems, the United States Patent Office was also beginning to work on problems of using machines to pull us out from the crush that we could foresee from the continued use of manual methods of searching. The earliest work was begun in 1946 and we have been investigating mechanized searching problems since that date, more or less continuously.

The points that I would now like to mention will fall into two classes. First, a brief mention of three systems that our examiners use today, and second a listing of the various research and development projects that are now under way in our office.

We have heard the steroid searching system mentioned several times in this conference. This system has been in use by the examiners since the early fall of 1957. This system has been implemented in part by cooperation with an industrial group, an association formed of the various American pharmaceutical manufacturing companies, who underwrote the prepartion of a good deal of the non-patent literature. In recent months, this work has been taken on by the Patent Office. In this system a direct coding method is used, each punch position on a standard IBM card being allocated to a specific structural feature of a steroid compound. The large nucleus that characterizes these compounds is assumed, and the card records all variations and substitutions on this nucleus.

A second system which is in actual use is one which deals with organic phosphorus compounds. This system exists in two versions, one of which uses an electronic computer, the other of which makes use of an IBM card sorting machine. The two are not exactly coextensive in the subject matter covered, nor in the logical facilities that they provide, so that in part the two supplement each other, and both are in use by the examiners.

A third system which is in use was described by Mr. Stein on the first morning of the conference. This deals with transistor circuits. The file now is approaching about a thousand documents in size and will be roughly double this size when it is completed. The descriptive factors are recorded for each of the circuits that are in this file, including some of the topological features of the circuitry and certain of the general behavior characteristics.

The rest of our program is still in the experimental stages and deals with a variety of subjects. In one project in the mechanical arts, a system is under development for recording and searching hydraulic circuits. This, of course, has some features reminiscent of chemical structures, other features reminiscent of electronic circuitry and many features that may be peculiar to the mechanical arts. Symbology for the mechanical elements in the fluid flow paths involved are being worked out in such a way as to permit tracing any of the operational sequences that occur in the hydraulic circuits.

Another system which is under development is one for recording information about artificial breathing devices.

Most of the other systems now being developed deal with chemical subject matter. We were trapped into believing, as were many people outside of this field, that the area of chemistry lends itself more readily to mechanization than do other fields. This illusion is largely based on the fact that there exists what seems to be a systematic tool to begin with, namely, chemical structural formulas. However, I think the experience of many people who have worked with this problem is such that we realize that this is not as simple as it sounds. Moreover, the experience of other patent offices has indicated that work in fields other than chemistry may be very worthwhile indeed.

A system which is known as PACIR deals with pesticides. This also is going to be available in versions for both computers and punched card machines.

The HAYSTAQ project is one which the National Bureau of Standards and the Patent Office have undertaken jointly. This system uses an electronic computer, and deals with chemical subject matter in terms of compounds, mixtures of materials, and processes. The largest emphasis in the last few years has been on chemical structure searching. The system is designed to permit any compound of known structure to be stored and searched and to permit an enormous amount of flexibility on the part of the user in asking his questions.

As a corollary to this, during this past summer we had a group of students (who were about to enter the university) who worked out an algorithm for taking the material which is the direct product of a chemist's analysis of a document and manually recorded in a minimal way and converting this minimum amount of material into the codes which are required for storage in this system.

Mr. Stein also mentioned the project which his group is about to embark on, in which the full text of a hundred transistor patents will be made avail-

able to a computer on magnetic tapes. Various kinds of linguistic processing will be attempted on this body of material.

The DRAM project involved an investigation into the development of an open ended, inverted file. Descriptors were generated concurrently with the analysis of the file which was to be mechanized. Chemical compounds, both organic and inorganic, were fragmented into substructures which constituted generic terminology for the compounds. Fragmentation was done by rules rather than by the use of a preconstructed vocabulary of fragments.

Non-compound information was analyzed by key words. A thesaurus-like grouping of these key words was contemplated. Relationships which were provided included the roles of compounds and the association of compounds into process sets.

The analysis was performed sectionally. The subject matter of the patent was partitioned into (1) general disclosure, (2) specific examples and (3) claims in order to discover various patterns of information, with the expectation that it would facilitate the analysis and encoding of the subject content.

There is other work which has gone on which is not directly related to searching systems as such, but which will hopefully, affect the design of large systems.

A method was developed for symbolizing chemical reactions and processes, which emphasizes the sites of reactions, that is the atoms and groups of atoms which are specifically changed, or among which the connections are changed or altered in various ways during the course of a reaction. These are recorded in a symbology which may lend itself to machine processing. We have published a report on this work that is available on request.

In another project, a new enumeration and linear notation system for chemical structures has been developed, in which a serious attempt has been made to overcome deficiencies in existing notation systems. We think that this goal has been largely achieved. According to the use of this system, every chemical structure yields a unique cipher, and each cipher can be translated into a unique structural diagram. The regularity of this is illustrated by the fact that in another summer program, an algorithm was developed for converting the linear cipher for any given compound into a structural diagram and displaying it on the face of a cathode ray tube. This algorithm has not yet been programmed for a computer, but we have reason to believe that this will be successful.

Some work has been done on the problem of storing and retrieving information relevant to legal decisions. We will hear more on this general topic later on in this program, but not on our specific work in this area.

A good deal of work on linguistic problems, which are at the heart of all of the problems that we are talking about here, has been supported by the U.S. Patent Office. Some of it has been performed in the office. Support has also been given to various studies in formal linguistics and processing of pictorial information undertaken by the National Bureau of Standards.

One additional use of machines that has been in operation for a number of years at our Office was mentioned by one of the earlier speakers. For many years we have had listed on punched cards (which are available for sale to the public) classification lists which enable a person wanting to know what patents are classified in various arts, to obtain the list of all numbers of patents included. Fairly recently we have added to these lists the classification of foreign patents, in the sense that they are classified by our examining staff into our own classification system.

We feel that the achievement of a fully mechanized information retrieval system for our Patent Office's use cannot be realized without solution of many of the basic theoretical problems that exist, as well as system and hardware advances. It is anticipated that we will expand our efforts considerably in all of these directions, while at the same time continuing to make use, in such areas as we can, of existing techniques.

Mr. Alexander: Thank you, Mr. Koller. Now, I would like to open the various presentations for discussion. I hope that in the course of these we can bring out some comparisons and differences. As a means of opening it, I would like to offer one myself, and that is to comment on the remarks of the gentleman from U.K. who said that it was unfortunate that they had done the electro-luminescent art, without realizing that the Institute in Holland had done the same item.

I think this is a happy circumstance and should be exploited. The intercomparison of the two procedures, since they apparently were done quite independently and I am sure from a different point of view, would be very desirable. An intercom-

parison report I think would be very useful to the community. I am afraid that in this whole area there is a great tendency to try to move from an idea to a useful operation, in a very short period of time and without thorough intercomparison. With the wide interest that must exist among all of us in avoiding the same pitfalls, I think cooperative efforts and intercomparisons would be very, very helpful. I hope that the discussion this morning can direct itself toward possible ways of cooperation and possible intercomparisons of work thus far.

With this opening plea, I am prepared to recognize questioners.

Mr. Rockman: I would like to ask a question of Mr. Jeffrey. Do you have what is called an open ended system, whereby you may add a descriptor to the system if perchance an inventor happens to come in with a concept that you do not have?

Mr. Jeffery: Yes, we do that. When electroluminescence first came in we added a descriptor.

Mr. Alexander: May I inquire, suppose the item which has been called to your attention for the first time because of a claim for novelty, is implied at least in part, in older documents, would you be able to go back and up-date the other references? Does the examiner provide a feed-back as a result of having observed that there is a partial relationship in some of the earlier patents?

Mr. Jeffery: Yes, that is a problem. We have to be very careful when selecting a new descriptor, that we make a very broad search in the accumulated material to make sure there is nothing like it. We make quite an exhaustive search in different ways.

Mr. Alexander: Suppose there is something a little like it but not sufficient to completely invalidate all the newness. So that there is some novelty, and therefore you must now build back into the old descriptors, into the old documents, some way to identify items that were called for but not by this type of terminology. Do you have a way of updating old material as a result of the fact that the examiner finds something in the old material, to which his attention was not called initially?

Mr. Jeffery: No, I do not think so. We would not treat the old material. A citation is read in the light of the knowledge at the date of the citation, not in the light of the knowledge at the time you happen to find the citation or need it. If the citation just mentions something in passing, and its significance is not realized, well, it is not a citation.

Mr. Rotkin: On that very point, sir, I think this is at the root of the problem that was discussed in part yesterday. A man who is looking at a document for encoding it, whether he wants to encode it in its entirety or in part, is going to encode only what he recognizes at that time. The fact that he does not recognize something does not mean that it is not necessarily in the document. Now, subsequent to his encoding that document, something else may call his attention to the existence of that facet of knowledge. It may be in the document if he goes back and looks at it. Should there not be some technique to permit the extracted information of the document to be up-dated?

Mr. Frome: Many speakers have said the examiner wants the output of a system right at his desk. I do not really believe he does. Our experience has shown that after he realizes that mechanization is not a monster, the examiner does not care how you give him the references. The only thing he would like to have is fairly fast service, so that after he has made a search, and wants another one, he can get it fairly promptly. And it has been our experience with about eight to ten examiners, that they do not care whether you use the computer or punched cards. All they want are the references handed to them. This illusion that it must be at his desk, I think, comes down to a psychological fact that he must have something to do with it. He should be able to control it. However, if you take the examiner who is actually going to use it, and make him part of the system or give him the illusion of being part of the system, he will completely accept it. It does not then matter whether he has it at his desk or not. In certain instances you cannot put a computer at a man's desk, it is just too big.

Mr. Alexander: Unfortunately, you can put a console at his desk, but you cannot afford it. So I think you cannot be quite that categorical about it. Whether or not this is desirable, has a great deal to do with the effective work habits of people. And I think, while I admire your enthusiasm, I believe there are many facets of this problem.

Mr. Rockman: I would like to get back to the previous discussion about adding new descriptors. I assume that the descriptors are listed as generic headings, with others under them as sub-generic, and sub-sub-generic, and so forth. This would be similar

to your classification schedules where you have indented headings. When you have to add a descriptor that you have not used before, if you can fit it under one of these generic or sub-generic headings you will not have to look back at every reference you have under the file but only those that fit under a previous generic sub-heading.

Mr. Stitelman: We have had this problem and we have tried to deal with it and we do just that. We are now working with a miscellaneous group of transistor circuit patents. Under each generic group we include a miscellaneous sub-class to avoid searching the whole file when it is necessary to up-date the file. This in itself will not avoid an exhaustive search for a new concept, but it should limit the number of cases where this should be necessary.

Another means for avoiding exhaustive search through the entire file, for a new concept, as Mr. Kalikow can tell you, is what Mr. Stern calls the "peek-a-boo" principal. You would take general terms, such as time, perhaps or other general terms which will define a specific new concept. Radar, for example, could be defined as detection by electro-magnetic means and echo means. If you use those three terms, you come up with radar in a broad sense. Now we tried to include this in our system as well as specific terms. The examiners in searching will often find that the devices they are dealing with are defined in a standard way and then there will be variations in structure later. We want to give them the facilities to search for such unexpected variations. This multiplies the number of terms required and makes it rather difficult to handle the situation. We have a hundred to a hundred and twenty-five descriptors for each document, on the average. This is too many. We will cut that down. But in any event, a substantial number of terms per document are required for patent searching.

Mr. Kalikow: I would like to suggest the way in which we handle this problem in our searching system. That is we interpreted or translated every complex concept, in each of the patents that we searched or that we worked on in the file, into a basic language code. In other words, we had no descriptors or rejectors, that would be complex words such as spectrophotometer or radar. That was not part of our rejector code or our descriptor code. We had only basic language terms. In that way, we were able not to have to worry about this problem of up-dating because we always dealt with basic concepts as we set up our search question and any new art always took advantage of these basic concepts. Electro-luminescence, for example, would never become a descriptor. This would be defined in very basic terms, in our classification of each of the patents, and therefore, the component meanings of the term electro-luminescence would already have been classified in each of the patents.

Mr. Jeffery: How would you express a transitor P–N junction in these basic terms?

Mr. Kalikow: I would have to give you our glossary where we translated every term, every word of the English language, into our basic terms. I went to Webster's Intercollegiate Dictionary and I did this. You would have to see how this is done. It is a process that you can train people to do.

Mr. Fairthorne: The belief and the hope, that we can reduce our statements into basic terms, atomic terms, a concept of one kind or another is, of course, a very long one. Leibniz and others tried to use it in a universal character. It is an unfortunate fact, or fortunate fact perhaps for the progress of the human race, that any term is complex if your interests change. The basic terms even in different activities are different. The atom of the sociologist might be a baby and from the physicist's point of view a baby is certainly not an atomic term. I think I myself held at one time the view that you might find certain common interests, shall we say, in the human activities to be dealt by weighting these terms or giving orders of preference. I am afraid I have had to change that view and I think nearly everybody else has in time.

The reason that anything belongs to a general class is not because it in fact belongs to it when no one is around. The classes and things do not exist if no one is around. The reason any specific thing belongs to a general class is because people agree to say it does, and for no other reason whatsoever. We are rather misled here by the taxonomists of the physical world and biological world who take objects and say you are only to look at certain bits and pieces of them. So in a way you get the idea that the genera and the species, and so forth, are natural objects. But they are not. They are interpretations of them. So, any system which deals with generic terms and specific terms, just has to have the lists of them there. There is no way out, because we do not even have the objects to deal with. We only have their names. And it is precious difficult to find out from the name of an object if all the prop-

erties in which people may be interested are in it. You can always make an artificial name if it has some of them. And when you do that you say you are dealing with basic interests. So you are. They are not eternal, and they are not universal. They are local and temporary, and that is why all these systems on basic terms work beautifully in small libraries with peoples' special interests. And a very good thing too. And I certainly think that excellent.

However, the main problem is how are we going to make it wider and more stable, and still retain some degree of, I will not say precision, but refinement. However, further refinement of course, in the sense of bibliography and not of social usage. I think we must be awfully careful when we talk of basic terms quite legitimately, not to think we are talking about sort of eternal atoms of the type Leibniz tried and failed, and a lot of other people have. I know I am telling nothing new to anybody here, but I just hope I am putting it a little more clearly perhaps than has been put recently here. I am certainly not attacking anybody. But there is grave danger here of thinking we have actual atoms of concepts.

Mr. Kalikow: I completely agree with what you said. It is just that this is a more rudimentary way of expressing the things. No question but what you say is absoluetely correct.

Mr. Alexander: May I point out, however that you find yourself backed into odd kinds of difficulties. I am quoting a remark by Don Swanson, who when faced with including the concept of cannibalism into an already existing scheme of coding, found that it might be forced in by combining capital punishment with unusual diets. I doubt, however, if anyone would arrive at cannibalism via this route.

Dr. Bigelow: It seems to me that one more point should be appended to Mr. Fairthorne's comment. Namely, that the crucial thing to look at, in view of this comment with which I completely agree, is the question of getting good parameter sets to describe the effective conventions of usage which are present today. In some sense or other the whole problem of being able to automatize some part of the patent procedure or library procedure, which is now done largely by humans, depends upon being able to choose descriptor sets and parameter sets which are effective for some reasonable time base, such as the time base it takes you to develop the system you are working in and to persuade people to use it. And secondly, that the effective systems shall have some natural evolution which can be up-dated concurrently with the field. So that you see there is nothing like rigor as Mr. Fairthorne said, nothing like invariance over time and over fields. Nevertheless, this is the essential heart of the problem. It is also the essential heart of many scientific problems.

I was thinking, as the speaker before last mentioned his classification system, of what difficulties you get into even within the narrow selection which might be electrical technology. You have to decide, for instance, whether radiation is a legitimate word. Now, radiation leads you to certain classes of equations. One of the big hiatuses in physics at the present moment, is that, in the small, the equations are no good. They have been good for at least a hundred years since Maxwell described them, but when you get down to small dimensions, all of a sudden radiation has no meaning. You have quantities which are related to the old ones and this descriptor has vanished.

So that I would emphasize again that we have only relative stability and relative applicability. What is needed is an effective treatment of these relatives.

Mr. Alexander: May I ask, does not this imply then that any attempt at mechanization must have inherent in it a continuous updating procedure that does not ground you with clerical effort? I think the important thing is that the shift in concepts are gradual. But the tremendous work load associated with making the necessary clerical notations to record the shifts, are the ones that usually prevent us from accepting them as they appear in use. It is in this area that I think the machines can be particularly helpful, except that we are not quite clever enough yet to know how to produce a steadily, easily up-dateable scheme.

Mr. Leibowitz: I think we are getting down to the heart of the problem by the recent comments. Mr. Koller said that the approaches of the foreign patent offices were different. But I feel that they are the same in the sense that it indicates that the state of the art is such that the approach is subjective and empirical. It depends upon choice and selectivity of descriptors. It is a hunting for what is the most selective descriptor for a particular specialized situation. Now, nobody has really said what these descriptors are. I find that there is confusion in the art, in the lack of definition of terminology. I am very happy to see that they have given a name to the broad field of information retrieval. It makes it easy now to tell people what I

am doing. Most of the time that answer, information retrieval, ends the conversation.

We talk about analysis. What are we analyzing for? Has a system been set up by an information retrieval expert, and then somebody analyzes according to this system, or is an analysis of information for the purpose of setting up such a system?

There has been a statement made that it is curious that the examiners are not willing to accept something new. I do not think that is so. I think it is a question of their being familiar with what it is. If they were told what it is they might be quite ready to accept it. I think the problem is one of getting all the examiners and all the information retrieval experts in on the job. Now, if the descriptors are very specific, there will be a wide difference and a wide disparity in the various systems. As soon as you go to a higher level of abstraction, you will find that they are very similar to each other. However, the job is bigger, because you do not have much discrimination in very general descriptors.

So, my viewpoint now is, that the best approach is to extract descriptors which indicate materials and objects and key words, from documents which are to be incorporated into a mechanized file as specifically as possible. Then one can work with this as a vocabulary and shuffle them around to generate classes or generic terms. This is modifiable as the case may be. With changes in the art, one can move these descriptors around. One need not go back to the original document provided one has been thorough in the first place in extracting these descriptors.

Mr. Alexander: I think in view of what you have said, Mr. Kalikow is entitled to a rebuttal.

Mr. Leibowitz: I did not disagree with him.

Mr. Kalikow: No, I do not think a rebuttal is necessary. I would like to point out that my previous comment about a basic language code, was merely dramatic for the benefit of someone who asked the question as to how it might be done in a small file. Those of you that heard me last night, know that this is not what I advocate. It is completely impossible in my mind, to use any kind of basic language or semantic code of this type, to work on the level of many, many documents as we are working. This is why I have firmly advocated that we put the full text of the patent into storage, and that thereafter we use all of these techniques that you people are developing here, in retrieval. You can retrieve on the basis of complex descriptors if that is more beneficial to you. You can retrieve on the basis of basic, or more rudimentary concepts if that turns out to be more beneficial to you in the particular search that you are making. And you can have programmed in your computer the relationships among the more complex words and the factored words. It is very important because these are the kinds of relationships that must in fact be put into the computer. But let us not just take one avenue of attack when we come to retrieval. All of these various techniques that are developing will be very beneficial, because what we are really trying to do, is trying to make an analogy in the computer, to what goes on in the mind of a searcher as he retrieves from the full text today. We want our computer to be able to do this and the mind of man uses many routes for getting the material out of the file.

Mr. Newman: One warning to people who set up a series of descriptors in a generic hierarchy. It is a trick that looks very simple. But one is inclined to forget that the hierarchy for example of dog, mammal, vertebrate, etc., ignores the fact that my dog Fido not only belongs to the genus mammal, but he belongs to another genus called burglar protection, along with a policeman on the beat and a lock on the door. As an additional example I would like to call attention to the fact that a thermometer is also a heat responsive device and the mere fact that you do some measuring on it, that you have a scale on it is incidental. If we go back to what was discussed on Monday, to the prime thing rather than the accidental use, it is a heat responsive device and not a measuring instrument. Using this approach you will find that you will be able to do better retrieval.

Mr. Alexander: The nature of this discussion, seems to bear on the comments of one of our discussants from the Netherlands. In Mr. van Waasbergen's remarks, he indicated that he obtained quite different results on the same document from several examinations on this document. I would like to ask for his comments regarding his appraisal as to whether this was new since there seems to be this interplay between whether or not the essential content was left out, or whether he wanted to use a different way of describing what he saw.

Mr. van Wassbergen: I can say that both examiners had the same essential things. The difference is, and it was rather considerable, that they were, so to

speak not in the center but on the periphery. They were certainly far apart in their descriptions due to the fact that one of the men was a chemist and the other one was a civil engineer. The field of laminates is a very big field, and such things as plywood and other things in the building field, were treated by the civil engineer. And the civil engineer, of course, has a different view on technical things than the chemist. The chemist is accustomed to work with polythene and that sort of thing. For instance, the civil engineer, looks to the structure which is being made with a certain material. So everything which goes into the erection of the structure, is called to his attention first. It is difficult to ascribe it to one thing. There is a whole complex of circumstances which have to be taken into account. The best way is to have these people discuss all cases about which they are not entirely sure, and then they come to a common result if they are intelligent people. If they are not intelligent you must not put them on the job.

Dr. Wooster: I am just wondering if the word descriptor is being used too loosely here. When I use Descriptor, I use it with a very capital D. I refer to it as the system developed by the same gentleman, I believe, who also developed the current "information retrieval". His name is Calvin Mooers. I use Descriptors in the sense of a fairly small set of terms, perhaps one to two to three hundred, very carefully defined. Many people apparently are using descriptors with a lower case d, and it would refer to anything all the way over to "uniterms." Some of the confusion that is being incurred, is the fact that everyone uses descriptors in the same way, or in a personal way.

One other point which I think applies to classification systems. A couple of weeks ago I was at the meeting of the UNESCO Advisory Committee on Documentation, and we were discussing classification systems. Madame Bagrova, who is very bright and the head of the reference department at the Lenin State library, says that classification systems are ideological and that they cut across linguistic communities. We are hoping to get UNESCO, not in science, but in some of the subjects dealing with "E" and "C" in the UNESCO title, to try in three different languages to see what sort of classification systems people will work up. So we have the personal problem in classification and each of us tends to classify things differently. But there is a language community in which we are working. I think point A is that if we use the descriptor, we should say in what sense we are using it.

Mrs. Marden: Yesterday, Dr. Bigelow made some very penetrating remarks, concerning the integrated man-machine use of a system in searching and the interplay between the two. Until we achieve a totally mechanized system, it might be well to keep this idea in our minds, of having the close relationship between the man and the machine. It seems to me that one of the best ways we can achieve the maximum utility from this combination is by not looking at all the material we have in a mechanized way, but looking at highly compressed stored information about the material, and then having man do some searching, perhaps backed up by machine searching, with the continual evaluation by the man of the end results. In connection with the searching of the subject material, perhaps we are trying to tackle too much to achieve a uniform mechanized searching of all the material. If we can have specialized searching according to subject matter, and have specialized systems with regard to the particular subject matter we are searching, until we can have a little more experience with searching the diverse kinds of subject material, we might eventually be able to bring all of these diverse systems together into a uniform system. Until that time, tackling the whole collection of scientific and technical material, may be too much for us in the first try.

Mr. Alexander: My reaction to this is that there is a story about the Tower of Babel. I am afraid if we go in diverse directions now, we will never come back together. This is my fear. Maybe the practicalities of the situation will dictate this.

Have I overlooked anyone who has not had an opportunity to have his comments heard? In that event, in order to give Mr. Lawlor a respectable opportunity to deliver his remarks, I will suggest that the corridor discussions take care of the remaining issues. With this I close the discussion session and I would like to turn the rostrum over to Mr. Glaser.

Sixth Session

Wednesday Morning, October 25, 1961

The sixth session was called to order with Mr. Ezra Glaser, Section Chief, Data Processing Systems Division, National Bureau of Standards, Moderator.

Mr. Glaser: Thank you very much, Sam. Mr. Reed Lawlor is well known to many of you. I am not going to take any time to give you a detailed account of his achievements, except to tell you that he is Chairman, of what I hope to be a very productive committee of the American Bar Association, to advise the Association on the various ways in which electronic computers and the technology that goes with them, can assist the lawyer in performing his functions. You will get a better idea of what is going on from hearing him, than from hearing me, so I will turn the floor over to him right away.

Mr. Lawlor: I feel a little bit out of place here. Except to the extent that I file patent applications I do not work for a patent office. I do keep some of the examiners busy and they keep me busy. But except to that extent, I actually have very little knowledge of what goes on in patent offices. Sometimes I cannot understand it.

Now, I probably look a little bit like the 1860 medicine man who traveled around with a lot of his wares to display them, and I do have some things here which I would like to show you. I will try to speak rapidly and I will try to cover a lot of material in the twenty minutes that is available.

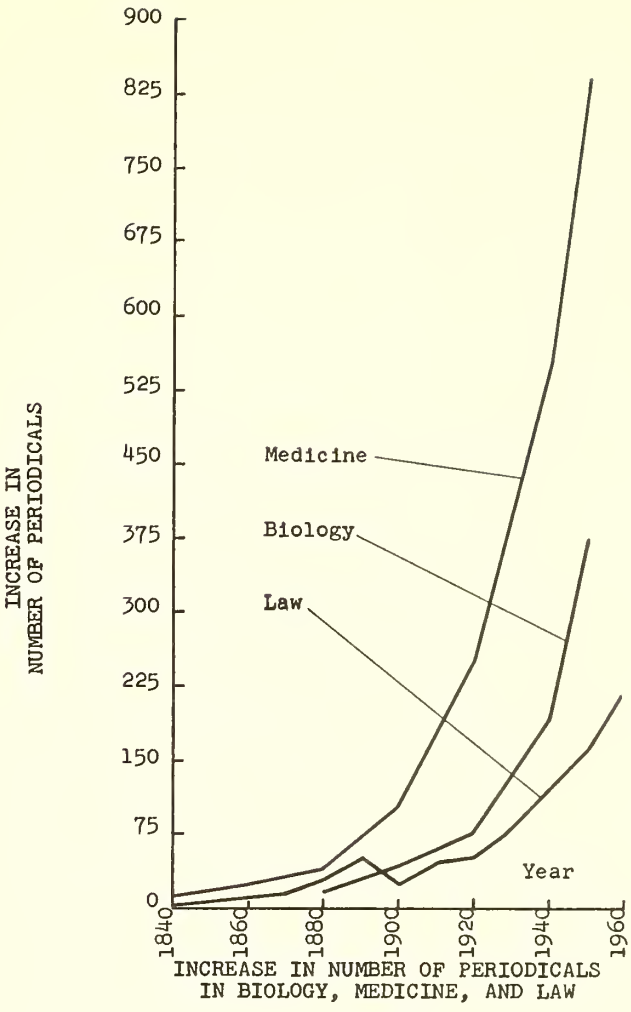
I want to open by bringing you greetings from John Satterfield, the President of the American Bar Association, and from Joseph Gray Jackson, the Chairman of the Patent, Trademark and Copyright Section. I am delighted to be here, and I am thrilled to hear all of these comments and to hear about the progress that is being made by all of you. The work in the American Bar Association is parallel in many respects to the work that you are doing. It is so parallel that it is about as incoherent as some of the work that you are doing. Many of you are working in diverse directions, but you are coming to a common end, I am sure. That is also happening in the American Bar Association. We have a committee; the committtee is made up of many individuals, each one of them wears at least three hats and we all have different interests and different goals. I won't tell you much about the history of the committee, except to say that it is traceable to an ancestor that was born in 1952. The main funtcion of our committee, as I see it, is to create both supply and demand. We want the lawyers to understand what computers can do for them. We want the manufacturers to know what the needs of the lawyers are.

I would like to talk about two principle subjects today, though there are many others which are of interest. I would like to talk a little about retrieval and I would like to talk a little bit about patent claims. There is a story that perhaps is suitable for this audience, and that is the story of the survey made by one of the computer manufacturers of the interests of the various people in a corporation. Men at different levels in the company were asked what the computers could do for them, what duties could be delegated to the computer. Everybody agreed, the President, the General Manager, the Supervisors. They all came to the same conclusion. "All the duties of my suborinates can be performed by a computer, but not mine." And this brings us to the first slide. (1) This is a computer here with two men standing before it. One of them believes in the abstracting system, and the other believes in the full text system. One of them says to the other, "Let me do the thinking around here." That is the problem that you have. Everybody is in love with the ideas to which he has grown accustomed. Now, actually there is a big debate. Should we abstract, or should we record full text? We have been abstracting in the law for years. Since I do not want to reflect on any particular publisher, I won't use names. But here is a publication in the law field. It gives the case, the arguments and the facts. At the be-

ginning of the case are head notes. These abstracts are inadequate for the lawyer. But they are his principal tool. For any mechanical searching system something needs to be done either to improve abstracting, or abstractors. Otherwise we must record full text. How we will do it we do not know. The University of Pittsburgh, has been leading the field on recording full text. They have recorded all of the Pennsylvania statutes verbatim. There are six million English words in these statutes. Now the question arises, what good is it? What can you use of for? If you had permitted a general lawyer to index these statutes, he would not have recorded many of the concepts which are in the text. He would have ignored them. Certainly if John Horty, who is Director of the Health Law Center, at the University of Pittsburgh, where this work is done, had come across the word patent, or the term letters patent, he would probably have ignored it because he is interested in health.

I would like to play a little game with you. I would like you to write down in front of you, the number of times that you think the word patent occurs in the Pennsylvania statutes. And the number of times that you think the phrase, letters patent, occurs in the Pennsylvania statutes. And in a few minutes I will show you the answer. Now let's take the next slide (Slide A). Let's talk a little bit about what you can do, or what you have to do. We hear about this exponential growth of information. This plots the number of periodicals, new periodicals being published each year, as a function on years. If you plot this on semi-log scale, you will make an interesting discovery. It is true. The growth of information in these three fields is exponential. You get a straight line function. In fact, you will find that the three lines are parallel. The information in all of these fields is growing at the same rate. It is increasing about tenfold in fifty years. I do not have similar data for patents. Undoubtedly you do.

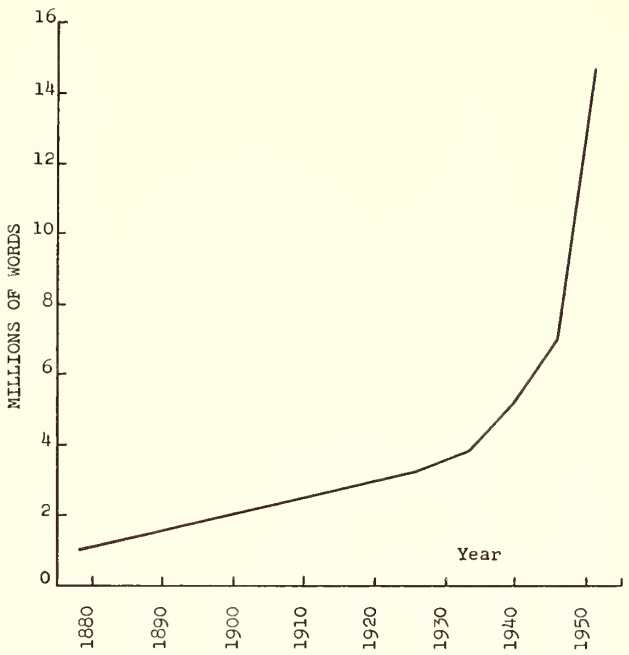
Let's take a look at the next slide (Slide B) to see what the Congress is doing to us. These are the number of words being added to our Federal statutes each year. Notice what happened in 1932 and notice what happened at the end of World War II. If you plot this on semi-log paper, you will find to your surprise that the rate of growth is more rapid than exponential. We need some brave Congressmen who will repeal laws and replace them with shorter laws.



SLIDE A

Let's have the next slide (Slide C). Now at the University of Pittsburgh, they use a computer that indexes the text (2). All the words are automatically listed in alphabetical order and opposite each word such as "incompetent," there is placed a number which is either the document, or the page, or the section number, or whatever it may be. This particular glossary was developed, this particular list was developed for the hospital law statutes. Now, as in the uniterm system, if you want to find where particular words are found in the same documents, why you just find the inter-sections and look them up. You can do this manually, but a computer can do it too.

Let's go to the next slide (Slide D). Suppose that you present the computer with this question; "Please supply me with a list of the statutes, and copies of the statutes that deal with the restrictions upon the remuneration that officials may receive from



FEDERAL STATUTES IN FORCE IN THE U. S.

SLIDE B

Imprisoned	59	61	....	....	....
Imprisonment	144	232	....	....	....
Improper	240	....	....	....	....
Improved	399	....	....	....	....
Improvement	87	227	386	....	....
Improvements	339	389	393	....	....
Improving	351	....	....	....	....
Inc	410	....	....	....	....
Incapable	102	....	....	....	....
Incapacity	102	....	....	....	....
Incident	146	148	....	....	....
Incidental	330	351	431	....	....
Include	77	140	175	260	262
	351	376	412	424	431
Included	57	383	404	431	....
Includes	428	....	....	....	....
Including	11	20	26	37	110
	242	245	250	274	279
	352	354	391	393	394
	428	429	....	....	....
Inclusion	337	....	....	....	....
Inclusive	170	345	....	....	....
Income	3	32	47	133	134
	323	339	344	348	350
	367	368	374	376	384
	406	407	409	415	421
Incompetent	97	98	116	118	122
Inconsistent	196	216	244	....	....
Inconvenience	2	4	....	....	....
Incorporated	46	129	136	246	249
	356	366	367	368	369
	397	403	407	413	....
Incorporation	57	130	132	138	146
	153	154	155	156	157
	360	383	....	....	....
Incorporators	147	....	....	....	....
Increase	406	....	....	....	....
Incumbered	355	....	....	....	....
Incurred	84	88	....	....	....
Incurring	86	....	....	....	....
Ind	10	11	12	96	153
	279	280	357	358	359

SLIDE C

LAWYER'S QUESTION

Please supply me with a list of statutes and copies of statutes dealing with restrictions upon remuneration for officials of charitable corporations.

BASIC COMPUTER QUESTION

(a+b+c+d+e+f) (g+h+i+j+k+l)

a=trustee
b=trustees
c=officer
d=officers
e=director
f=directors

g=compensation
h=compensations
i=salary
j=salaries
k=remuneration
l=wages

SLIDE D

charitable corporations." Now, there are certain basic concepts here. You have the related terms trustee and trustees. You would have to put both the singular and the plural into this type of question, as the program has been developed so far. Officer, officers director, directors; these are all synonyms, they have the same concept in common. Here is compensation, compensations-salary, salaries, remuneration and wages. I do not know how many of you know how to read this kind of equation, but if you do not you had better learn. This is symbolic logic. You must be able to communicate not just with the computer, "er", but with the computor, "or", and this is the language that he speaks. What you want here are documents that include either the word a, or the word b, or the word c, or the word d, and so on; and the word g or the word d, or the word h, or i, or j, or k, etc. This is a logical product of two logical sums. Let us see what the computer produced. Here is a list (Slide E) of the hospital law statutes of the United States, which deal with that subject as located in the computer with this type of question. The document numbers are on the right; the citations are on the left, the lawyers who saw the demonstrations

Fla. Stat. Ann.=S 155.16 (1943)..... 001
Fla. Stat. Ann.=S 155.16 (1943)..... 007
Ill. Ann. Stat. C. 24,=S 44-6 (Smith-Hurd 1942)..... 009
Ind. Ann. Stat.=S 22-3229 (Repl. Vol. 1950). 012
Iowa Code Ann.=S 347.16 (1949)..... 015
Mich. Stat. Ann.=S 14.1139 (Rev. Vol. 1956)..... 016
Mo. Ann. Stat.=S 205.270 (1952)..... 019
N.C. Gen. Stat.=S 131-19 (Recomp. Vol. 1952)..... 029
N.C. Gen. Stat.=S 131-28.17 (Recomp. Vol. 1952)..... 030
Wyo. Comp. Stat. Ann.=S 44-1009 (1945).. 145
Cal. Corp. Code Ann.=S 10206 (Deering 1953)..... 146
Neb. Rev. Stat.=S 21-1503 (Reissue 1954).. 147
Nev. Rev. Stat.=S 81.310 (1957)..... 148
Nev. Rev. Stat.=S 85.050 (1957)..... 149
Wyo. Comp. Stat. Ann.=S 44-1009 (1945).. 150
Fla. Stat. Ann.=S 155.18 (1943)..... 183
Nev. Rev. Stat.=S 450.440 (1957)..... 205
Conn. Gen. Stat.=S 12-81 (1958)..... 338
Me. Rev. Stat. Ann. C. 91-A,=S 10 (Supp. 1957)..... 366
N.Y. Tax Law=S 4..... 389
Tenn. Code Ann.=S 67-502 (1955)..... 415
Wis. Stat. Ann.=S 70.11 (1957, as Amended Supp. 1959)..... 431

SLIDE E

of this method in Washington, D.C., in 1960, were delighted to go home and find that the computer selected the citations in their respective states.

Now, instead of getting out just a list of citations, such as patent numbers, you could get out the full text. This could be a portion of text that is pertinent to your subject; or could be full text. Let's show the next slide (Slide F). Here we see portions of some of the statutes referred to in slide E.

Now, how many of you, have guessed that the word patent occurs more than ten times in the patent statutes? How many have guessed that it occurs more than 100 times? Very good. The word "patent" does occur over one hundred times in the Pennsylvania Statutes. Here is the print that was made last Saturday at Pittsburgh. I also asked John Horty to print out citations of statutes which have the word copyright, which have the word invent, or any other word having that root, the word patent, with letters patent, and so on, and trademark and servicemark. Would you like to pass that around for those who are interested?

Now, if you record full text you have not prejudged the questions which will be asked. If you record full text you have not lost information. If you abstract you will lose information, and you will

Neb. Rev. Stat.=S 21-1503 (Reissue 1954).. 147
=S 21-1503 Stock, Dividends, Salaries, prohibited.
Such (nonprofit) corporation shall have no capital stock, and shall pay no dividends or salaries to its incorporators or board of directors.
Nev. Rev. Stat.=S 81.310 (1957)..... 148
=S 81.310 Powers of corporation.
The (nonprofit) corporation shall, as an incident of its purpose and without any necessity for expressing the same in its articles of incorporation, have the following powers, which it may exercise in full measure without the necessity of obtaining any order of court by authorization, approval or confirmation.*
* * * (5) To appoint and pay officers and agents to conduct and administer the affairs of the corporation, but no member of the board of trustees shall receive any compensation.
Nev. Rev. Stat.=S 85.050 (1957)..... 149
=S 85.050 Trustees not to receive compensation.* Exception: No trustees of the (nonprofit) corporation shall be entitled to any compensation except under some special employment of the board, or authority expressed in the original deed or instrument of trust.
Wyo. Comp. Stat. Ann.=S 44-1009 (1945).. 150
=S 44-1009 Officers receive no salaries.
No officer of any corporation formed under the provisions of the . . . 9th sub-division of =section 1 (=S 44-1001 =Hospitals and infirmaries) shall receive any salary or remuneration from such corporation for his services as such officer, . . .

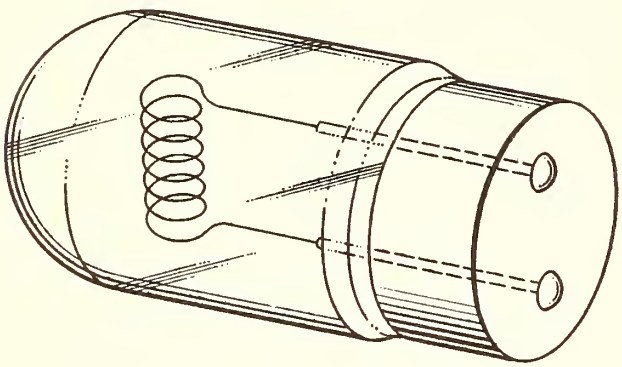
SLIDE F

have to go back and make new abstracts from time to time, as has been said here so many times.

This particular material, the Pennsylvania Statutes, includes six million words. Half of them, three million, are insignificant. They are articles, prepositions, conjunctions, and so on. These are insignificant from some viewpoints, at least if you are searching by key words; three million of them. The entire text is recorded on four reels of tape. About twenty minutes to one hour is required to make a single, complete search. As many as 500 terms may be utilized simultaneously in making searches, and as many as ten searches can be made simultaneously. However, in that case the search time is increased.

Other material has been recorded too, such as all of the Maryland Health Law Statutes, and other statutes. The New York Statutes will be going into the tapes soon, and so will the New Jersey Statutes, and then at that time some comparative language studies can be made.

Due to the shortness of time, I want to skip some of this material and talk a little bit about patent claims. I have some copies of a paper here that I have written. (3). This is a mathematical theory of patent claims, and I am not going to go into it, except to show some of the work that has been done here. Let's first take a look at the next slide (Slide G).



SLIDE G

1. An electric light including:
   a base having two mutually insulated electrical contacts mounted thereon;
   a transparent envelope rigidly connected to said base; and
   a coiled metal filament within said envelope, the two ends of said filament being electrically connected to said contacts.
2. An electric light including:
   a base
   a transparent envelope sealed to said base;
   two electrical conductors extending through said base into the space enclosed by said envelope; and
   a coiled filament within said envelope.
3. An electric light including:
   a base composed entirely of insulating material;
   two electrical conductors projecting through said base along parallel paths; and
   a tungsten filament having its two ends connected to the respective conductors on the same side of said base.
4. An electric light including:
   a base composed entirely of insulating material;
   two electrical conductors projecting through said base;
   a tungsten filament having its two ends connected to the respective conductors; and
   an evacuated transparent envelope sealed to said base and enclosing said filament and the adjacent parts of said conductors.

SLIDE H

1. The object is an electric light. The light includes a base. Two mutually insulated electrical contacts are mounted on the base. The light includes a transparent envelope. The envelope is rigidly connected to the base. The light includes a filament. The filament is composed of metal. The filament is coiled. The two ends of the filament are connected to the contacts. The filament is within the envelope.
2. The object is an electric light. The light includes a base. Two electrical conductors extend through the base. The conductors extend into the space enclosed by the envelope. The light includes a transparent envelope. The envelope is sealed to the base. The light includes a filament. The filament is coiled. The filament is within the envelope.

SLIDE I

Suppose that we were getting a patent on this electric light bulb a few years ago. Some claims might have been allowed, like those on this next slide (Slide H). Note that they are written in the new format that is now approved by the United States Patent Office. Notice that the claims refer to parts such as a base, an envelope and a filament. That is one type of element in a claim. The claims also refer to the properties of the parts such as transparency, coiling and tungsten composition. And then we also have relations such as insulating, enclosing and connecting. We have three types of concepts involved here—parts, properties, and relations. In American patent law, as you know, claims may define intersecting classes. An invention may be covered by one claim or another, but not both. This is not true with most foreign countries. Usually if an object is covered by a later claim of a foreign patent, it is also covered by an earlier claim of this patent. In effect you have one broad claim and then narrow ones inside of it. But under our system, claims in the same patent may overlap.

Now, the first step, I think, in making claims easier to search is to rewrite them. Let us take a look at the next slide (Slide I). Here, the context of the two claims has been rewritten at strings of sentences. Each of these sentences must be true about an object for it to be covered by one claim. Each of these sentences must be true for the object to be covered by claim two. Now, if we can plot this kind of information, we can analyze a claim problem with a computer, in a matrix. Let us look at the next slide (Slide J). Here are the twenty sentences required to express the four claims of this

Manufacturer's requirements	Claims				i	q_i
	1	2	3	4		
+	1	1	1	1	1	The object is an electric light.
+	1	1	1	1	2	The light includes a base.
	0	0	1	1	3	The base is composed entirely of insulating material.
+	1	0	0	0	4	Two mutually insulated electrical contacts are mounted on the base.
+	0	1	1	1	5	Two electrical conductors extend through the base.
+	0	1	0	0	6	The conductors extend into the space enclosed by the envelope.
	0	0	1	0	7	The conductors extend along parallel paths.
+	1	1	0	1	8	The light includes a transparent envelope.
+	1	0	0	0	9	The envelope is rigidly connected to the base.
+	0	1	0	1	10	The envelope is sealed to the base.
	0	0	0	1	11	The envelope is evacuated.
+	1	1	1	1	12	The light includes a filament.
	1	0	(1)	(1)	13	The filament is composed of metal.
	1	1	0	0	14	The filament is coiled.
	0	0	1	1	15	The filament is composed of tungsten.
+	1	0	0	0	16	The two ends of the filament are electrically connected to the contacts.
+	0	0	1	1	17	The two ends of the filament are connected to the respective conductors.
+	0	0	1	0	18	The connections between the filament and the conductors are on the same side of the base.
+	0	0	0	1	19	The envelope encloses the filament and the adjacent parts of the conductors.
+	1	1	0	0	20	The filament is within the envelope.

SLIDE J

hypothetical patent. If there is a "one" opposite a sentence, this means that that sentence must be true, for the object to come under the claim in the corresponding column. Now you can write these claims then, individually, as mathematical formulae. You can also describe the prior art in the form of the same sentences, using something like a semantic code, such as that which has been developed at Western Reserve. If you write your claims this way and if you describe your prior art this way, then you can do some automatic searching which will anticipate individual claims, not just locate broad ideas.

Now, in just a couple of minutes, I will tell you about something I have done with this type of analysis. Here is a list of manufacturers' requirements (column 1 of Slide J). Wherever there is a plus sign opposite a sentence, that sentence must be true for a company to be manufacturing electric lights at all. And the question is, how can a manufacturer meet those requirements and avoid all the claims. Let us take a look at the next slide (Slide

$$p=1*2*4*8*9*12*13*14*16*20 + 1*2*5*6*8*10*12*14*20 + 1*2*3*5*7*12*13*15*17*18 + 1*2*3*5*8*10*11*12*13*15*17*19 \quad (E3)$$

$$r=13*14+14+3*7*15+3*11*15 \quad (E5)$$

$$r'=(13'+14')14'(3'+7'+15')(3'+11'+15') \quad (E6)$$

$$r'=14'15'+3'14'+7'11'14' \quad (E7)$$

7′ The conductors that extend through the base are not parallel.
11′ The envelope is not evacuated.
14′ The filament is not coiled.

SLIDE K

K) which is just one of a series that shows how to do it. You use mathematics. Each claim is represented by a logical product of a string of sentences, each of which must be true to meet the requirements. If you remove the sentences that relate to the requirements, you have a residue here (Equation E5). When you negate Equation 5, you end up with three classes of objects which meet the requirements of a manufacturer (Equation E7) but lie outside the scope of the patent. Each of these classes can be translated into plain English, which in the case

of the last class means: if you will manufacture an electric light in which the conductors that extend through the base are not parallel, and the envelope is not evacuated, and the filament is not coiled, you meet your manufacturing requirements; but your light will lie outside the literal scope of the claims.

Now, if you do not like mathematics, you can use a computer program that I developed to do the same thing. Here is a printed output (Slide L) that tells the President of a company in plain English what he must manufacture to avoid the claims.

With this system, you can take the string of sentences, you can take descriptions of objects, or descriptions in the prior art, you can match them up, and you can do your searching automatically. Some day I am sure that will be done.

Mr. John Doe, Attorney
10512 Maine Street
Hometown, U.S.A.

To avoid literal infringment of the claims of Patent No. 156038, and still conform to the requirements of your client Mr. Harry R. Smith, as set forth in your letter dated September 10, 1961, your client should manufacture devices which are described in one of the following paragraphs.

either
The base should not be composed entirely of insulating material.
and
The filament should not be coiled.
or
The conductors should not extend along parallel paths.
and
The envelope should not be evacuated.
and
The filament should not be coiled.
or
The filament should not be coiled.
and
The filament should not be composed of tungsten.

The foregoing conclusions deal only with literal infrignment. Problems involving the doctrine of estoppel, the doctrine of equivalence, and other legal doctrines often employed by the courts in the interpretation and application of claims have not been taken into account.

Respectfully submitted,

Reed C. Lawlor.

SLIDE L

Now, there is other work going on in the application of information technology to laws. People are interested in predicting court decisions. The techniques are being developed actively, and they are working real well. There are also people who are devoting their time to the use of symbolic logic for the analysis of legal documents, decisions, statutes, language, and so on.

A paper describing a method by which 40 legal points were utilized to characterize fifteen cases, were presented at the 1961 St. Louis convention of the A.B.A. (4).

To those of you who may be interested in following the work of the Electronic Data Retrieval Committee of the American Bar Association, I would suggest that you subscribe to *MULL*. This is a unique magazine. It is devoted entirely to applications of information technology to laws (5).

In closing, I want to read a little poem, a paraphrase of one written by Ted Lassagne, of Librascope.

This is the tale of the 1401,
The patent searcher that was nobody's son.
It spends its days in a futile hunt.
For prior art and argument.
After it finds them, it burns with shame,
It's obvious, says Examiner, just the same.

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2. Horty, John F., "Experience with the Application of Electronic Data Processing Systems in General Law" 60 *M. U. L. L.* 158; See also *Proceedings of Electronic Data Retrieval Committee for 1960* (Bureau of National Affairs, $2.00).
3. Lawlor, Reed C., "Analysis of Patent Claims by Mathematical Logic" *1961 Summary of Proceedings* (Section of Patent, Trademark and Copyright Law, American Bar Association, $1.50).
4. "1961 Proceedings of Electronic Data Retrieval Committee" (in Press, 1962 *M. U. L. L.*).
5. Subscriptions to *M. U. L. L.* may be obtained at $4.00 per year from the American Bar Association, 1155 East 60 Street, Chicago 37, Illinois.

Mr. Glaser: Our speaker has made such breathless headway, that we have time for some questions, as well as for examination of the exhibits that he brought. You ought to tell them what MULL stands for.

Mr. Lawlor: Well, MULL is an abbreviation for Modern Uses of Logic in Law. Things go so fast

nowadays, and people just cannot keep up with knowledge, that our Committee published this magazine in violation of all of the rules of the American Bar Association, and it took a year and a half to get their approval for their endorsement.

Dr. Bigelow: Sir, how would you code in your language the process which involves the three ingredients for a color composition which becomes say, semi-solid and turns green and shows stride?

Mr. Lawlor: Break it up into primitive sentences. Say, three substances are mixed. First, second and third. The first substance is so and so, the second substance is so and so, and the third substance is so and so. In other words use plain English.

Mr. Kirsch: The text that you show in the regularized form of the claim, is what Harris of the University of Pennsylvania, technically calls a kernalized text. I think it is only fair to point out that several years of research have been devoted to attempting to make precise, the process that can be used by people in particular and hopefully, ultimately by machines, in order to, in some systematic way, produce the kind of regularized claims that you show. Harris has suggested and apparently he subscribes to this thesis, that the kernels of the text are a very useful surrogate of the text for retrieval purposes. However, whether or not one can do this systematically, even if one is a linguist, possessed of the usual resources that linguists have, is at the moment somewhat questionable. I think that in fairness ot those people who are less familiar with the technology here, we should point out that it is quite conceivable that one might do what you are suggesting systematically, regularly or conceivably even automatically but we are rather far from that at the moment.

Mr. Lawlor: I do not think so. Whenever experienced patent attorneys write patents, most of them write the claims first. They then write the specification. They use the claims as a basis for writing sentences. There is no reason why those sentences could not form the claims. We do not have to wait for the linguist to make progress. We use language every day. We file patent applications every day. We can do it now. We do not have to wait for theory.

Dr. de Haan: I think it was a very interesting speech. We have seen much of the contents of the Pennsylvania laws brought in to a computer. But I feel inclined to ask the speaker, who is himself a lawyer, if all this data you get from the computer are of any help for you as a lawyer, to give an interpretation of the Pennsylvania law?

Mr. Lawlor: This is all experimental. There has not been enough work done to be able to answer that question. I am convinced though that it will help. I plan to send this particular digest to one of the patent law associations in Pennsylvania, and suggest that they publish the list of Pennsylvania Statutes that mention letters patent, for the benefit of the patent attorneys. I am sure a few of them have them.

Mr. Fairthorne: I would like to ask whether the word logic here has been used really quite fairly? A hundred and twenty years ago, a form of algebra was developed for a very narrow type of what might easily be called logic, although it certainly does not carry the same weight as what logic does to most people. Historically, that form of symbol manipulation that was used has all characters of the word logic in it, but no longer necessarily has any connection with logic at all. You go to Boolean algebra or something, and it is most unfortunate that people think that Boolean algebra is symbolic logic. Now under certain circumstances, it is valid to use it in logical situations. I am not here at this moment making any criticism one way or the other, although I certainly will in the future, on this matter. But do be careful, because we are dealing with a form of symbol manipulation. Dr. Bigelow, I think, has mentioned one thing that cannot in fact be put in terms of the binary function which are binary operations. You can not get ternary relations into binary except the most exceptional, and so on. One has to be very careful.

And the other thing is, what entities do these letters stand for? Do they stand for concepts? Do they stand for word occurrences? Do they stand for documents? The algebra is perfectly valid for sets of objects. Doubtless to say you can have products of sets, things that are commonly two sets and so on. But there is no guarantee ab initio, that a set of words has a corresponding set of documents that is of the slightest use to you, or that the set of words, or the set of concepts, or the set of documents in exact correspondency work. I am not saying they are not there. But I say you must not assume that they are. And I do think that there are a great many things that need to be made a little clearer, before we can discuss details. My own views on this matter are that Boolean algebra is grossly exaggerated unless

it is very carefully handled, but that is not at the moment important.

Mr. Lawlor: I would like to add one comment to that. Boolean algebra is only a very elementary form of symbolic logic.

Mr. Glaser: I believe we still have a chance for one more question before we will be deprived of our lunch, which would be a very serious matter.

Mr. Kirsch: I think the crucial issue here, and one which I would like this afternoon if I may, Mr. Lawlor, to elaborate on, is this. Shall we present to the community of people who are concerned with solving some eminently practical and difficult problems, a class of techniques which will be rather costly for them to become familiar with, and to suggest to them, which I would suggest is inappropriate at the present time, that these techniques offer solutions to problems rather quickly? Shall we present these techniques to them in this guise and incur the possible danger of misunderstanding and a consequent disillusionment? Or shall we attempt to present these techniques as techniques which have some very limited, conceivably ambitious goals, but not attempt to oversell them and consequently represent appropriately, the time scale, the cost, the amount of energy that is necessary in order to achieve the kinds of things that presumably you and I are both interested in being able to do? That seems to me to be the crucial issue here.

Mr. Glaser: I think I will have to, to stay on our schedule, end this part of the meeting. The course of a working group is such that we are back to our original schedule, having covered exactly the things that are on the printed program. We will move Mary Stevens brief talk on character recognition and pattern reading, to the afternoon. Therefore, the afternoon will consist of the presentation of Russell Kirsch, the one of Dr. Heilprin and a brief talk by Mary Stevens. Then as I announced this morning, Dr. deHaan, and a discussion of Dr. deHaan's suggestions after that. That will conclude the afternoon session and the conference.

A recess for lunch was called by the Moderator and the meeting reconvened at 2:00 P.M.

AFTERNOON

Mr. Glaser: We have a very ambitious program, so we want to start promptly. I should first like to explain that both the Commissioner, Mr. Ladd, and the Assistant Commissioner, Mr. Fay, of the United States Patent Office, were forced to be away this morning, because they were in a hearing before the Budget Bureau. I am sure you all know enough about the American System of government to know that that has something to do with money. We do not like to seem too mercenary in the Federal Civil Service, but the fact is that these matters must be given a high priority. Mr. Fay is back with us now and will have something to say in a few moments.

This group is not a duly constituted parliamentary group, it has no charter and therefore can pass no resolutions. I will ignore the niceties of this legal situation, and entertain two resolutions, if the group is so minded. I think I would be willing to consider first a resolution on the part of the group, thanking our hosts for the hospitality they have offered us, partly in the form of lunches so large that we will have trouble staying awake for the afternoon session. Our hosts are of course, the United States Patent Office, the Patent Office Society, and the National Science Foundation. In order to suppress debate on this matter, I would be willing to entertain a resolution which merely states the sense of the group and does not require a detailed drafting job.—We have a motion. In the absence of opposition, I will instruct whoever it is should do these things to communicate with the three sponsors and thank them for their colorful and generous hospitality.

I will also, now that I have a precedent, entertain a second resolution, this one to the program committee (and since I am not on any of these things, by the way, I can do this in good form) which was headed by Harold Pfeffer and Mr. Gorecki of the Patent Office, for their work in organizing this Workshop, which seems to have had just about the right amount of scheduled program, and time for us to talk about the things that really concern ourselves. I will therefore, entertain a motion to thank them for their hard work on this conference.—In the absence of debate, I will assume according to our unwritten charter that these resolutions have been adopted unanimously.

And we now will proceed with the program. The program has been rearranged yet again. Dr. de Haan's presence here is sufficiently important that everybody in town seems to want him for something. Therefore, we are going to move at once to the part of the program which was originally labeled "Concluding Remarks." I already warned you we are not going to be concluding at all but merely starting.

After his remarks, Commissioner Fay of the United States Patent Office, will say a few words and I think they will have something for us to discuss. This will carry us up to the coffee break. It seems a shame to talk about food so soon. And then we will proceed with the papers that are on the program. Without further delay then, I will turn the meeting over to Dr. de Haan.

Dr. de Haan: Thank you very much, Mr. Glaser. Ladies and gentlemen, first of all, I have to apologize to the speakers who are scheduled in the program at this moment, for the fact that I have been brought in before them. My indiscretion is only due to the fact that I have been invited by Commissioner Ladd to say something in the Patent Office, to the examiners of the Patent Office, about the Netherlands legislation on patents at four o'clock. That would normally be the time that was reserved for me for giving my concluding report and remarks. I am very sorry that at this moment I am not in a position to also consider in these remarks the contents of the very interesting addresses which will be made after I have left this meeting. Ladies and gentlemen, I was a bit surprised when I was brought into this program to give the concluding remarks of our three days meeting here. Personally, I thought that a U.S. attendant of this Workshop was much more qualified than I, myself, to give concluding remarks. I apologize once more that I have to speak in a language which is not my own, and even as the situation requires, that I have to speak about a matter which is not as familiar to me as the Netherlands Patent Law.

I shall try to do my best, and give some observations about what we have discussed, my impressions about it; and then I shall try to come to conclusions. We started Monday morning, after the very interesting introductory remarks of Commissioner Ladd and Commissioner Watson, to attend lectures about the existing classification system. We heard about the International Patent classification from Mr. Rubach, the United States patent classification from Mr. Vincent and the British Classification System from Mr. Knight.

Allow me to make a very general remark about classification systems. What is the aim of all classification systems used by examiners, either Patent Office examiners, research examiners or industrial examiners who have at their disposal tremendous files of documentation? Well, the aim of classification is to bring together the documents which are related to one another, so that the examiner does not have to screen the contents of all his documentation. That way he knows where he has to examine and which may be relevant documents for the search he has to make, and he can leave aside those documents which according to the classification system are of no interest to the question with which he has to deal.

Now, we have the existing classification systems, which the speakers explained to us Monday. Well, I have already observed that in my opinion, all three classification systems are as good as they can be and that any preference for any one of them is, in my opinion, not very well founded. I think an examiner accustomed to it can work with it. But these and other classification systems (except perhaps the British System) all have in common that documents are introduced into the system after usually one entry, perhaps with some superior entries, but each document gets a place into the system. The differences of the existing classification systems are that the entries are different, so that for instance, in the U.S. classification system and the IPC and the German and the Netherlands Systems, the individual documents are classified in quite different groups and subgroups and in the patent offices they are placed in different pigeon holes.

Now the difficulty with the existing classification systems is, if I may speak now only about the patent offices, that the inventors are so very unkind as not to take into account the classification systems with which we work. I mean to say that each patent application, and also each granted patent, contains some subject matter which according to the existing system can be classified in more than one class or group, and pigeon hole. But as we have so many specifications and so many documents that we are unable to classify them in many groups, it must suffice to put them only in the groups and pigeon holes which seem to our classifiers the most important ones. And that is the reason that when searching in a certain classification system, it is very difficult to know if in searching in one class or group, you have really found all the relevant matter. We are all accustomed to the type of patent application that requires a search in several groups if one desires a thorough examination.

To come back once again to the different systems, we also discussed the possibility of arriving at a uniform classification system, on what I might call the old basis as we use it now. I have observed that I think this would be very difficult. I men-

tioned that our existing classification systems are heavily burdened with tradition based upon experience and that it would be difficult for the various patent offices to break this tradition. There is still another reason. You must realize what a tremendous amount of capital is invested in the existing classification systems. If we should like to arrive at a new system or to a coordinated system, it would be necessary to reorganize our entire documentation system. That can be done, but only very slowly, and only where it is necessary that some class be reorganized. Then you can perhaps reorganize into another system as we intend to do in Europe, where there is not too great a difference among classification systems in the countries which have accepted the International Patent Classification. But I think that at the present moment this calls for our discretion. There is a much more important matter, viz., what we call the mechanized search, and I think it has been made sufficiently clear during these days, that if we desire to come to a mechanized searching system, a complete revolution of our classification and documentation is necessary, and this revolution will take place in all the patent offices who want to change over to a mechanized system. It is an advantage, that we are now all on the same level. I mean we have to start something new. And if we start something new, international cooperation in this field is much easier than if we have to bend existing systems to a common end. And so, I should like to speak now about the general topic of our Workshop, the mechanized system.

Quite a lot has been spoken about terminology, and first of all I should like to trace what we understand of the mechanized system. It is a system in which we perhaps use machines, but I do not think that that is the most relevant characterization of the system. What we in fact understand (and I hope to hear your opinion about this) of a mechanized system, is that we introduce subsidiary filtering means between the searcher, the examiner, and his files. Thereby it is possible to give to the examiner, on his desk, only the relevant documents and preferably more of them than he can get with the existing searching systems, in which he makes his search among the documents themselves and has to study quite a lot of them, of which he finds the greater part to be of no interest at all. What we want to achieve with a mechanized system, is not so much to prevent an examiner from studying documents, as to have the means to give the examiner on his desk less, but more relevant documents than he can get at the present time. And to achieve this end, we want an intercollation of some system, some tools which help us to select the relevant documents. These tools, Mr. van Wassbergen said this morning, may be lists in which the relevant features of each document are in a certain order, written down so that the examiner can determine which documents are important. It may be a punched card for manual selection. It may also be a punched card for a machine. And in the last instance, it may be a magnetic tape of a computer. Well, if we take the list and the simple peek-a-boo cards we see that these can be used without any machine. The punched card for a business machine, the magnetic tape for a computer, it is self-evident must be handled by a machine.

Now, to avoid all misunderstanding, I should like to say that it is perhaps a bit premature to aim at a fully mechanized system. I should prefer that we aim at a system in which we may eventually use machines. I think everybody agrees with me that a manufacturer, who uses machines in his plant, does not yet have a mechanized production system. Therefore, it is quite important and I should like to draw the attention of the linguists to it, that in our discussion, we give a definite, specific meaning to the word "mechanization" and that we should not use it in the sense in which it is used in industry.

And now about these tools which are put between the examiner and his files. Well, they can be of all kinds. We have heard very interesting talks about abstracts from Mr. Jeffery of Australia, from Mr. Kotaro Otani of Japan, and from Mr. Wolk. Even so, these are tools which are generally not for machine searching systems. But abstracts are made to facilitate the retrieval of relevant documents for a search. And we have heard that many searches can be done very well with the help of abstracts. I think that to a certain extent also, the holes punched in a card or the symbols on magnetic tape are abstracts. They all contain the most important fractions of a document in such a manner that we can use them to retrieve this document. What now is our task? It seems to be that we investigate those tools that give us the possibility to retrieve documents.

I think that the result of our discussion in the past days, is that depending on the art in which the search is made, special kinds of tools can best be used. In many parts of the art, it will be sufficient to work with lists or with peek-a-boo cards. In more complicated fields of technique, we have to

change over to punched cards for business machines and perhaps there are arts in which we are obliged to use a computer.

I feel our first task, if we desire to arrive at what you call a mechanized system, is to consider what tools we should use, how we can make them, and what system we want in order to retrieve relevant documents.

There was also a discussion about preparing these tools automatically. The automatic preparation of abstracts, the automatic transcription of documents onto a punched card, and so on. I think it is very interesting and I hope that those who are now doing research in this topic will succeed as soon as possible in finding a method for automatically abstracting documents. But at the present moment, we do not yet have a system at our disposal which would be sufficiently elaborate to satisfy us Patent Office men.

So I think as we all know, that our Patent Offices are in very great need, and that without sufficient manpower we cannot go on with our hand searching. We must find some way to work toward what we call a mechanization. And so I think our first task is to find means to establish those tools which serve for retrieval of relevant documents. These tools differ, as I have said, from system to system. And so I think we must first of all consider the various arts and which system would be most adequate for each art as has already been done for some arts in the Australian and the British and International Patent Institutes. If we do that, I think the use of the system of lists and the system of peek-a-boo cards will not give too much trouble. But if we want either business machines or computers, then I think we have to make a very thorough study of how to organize the information in documents in such a way that put into the machine and handled by the machine, they will give us not a direct answer about the novelty of an invention, but will give us the most relevant documents which have to be studied in order to judge the novelty and patentability of such an invention.

And I feel that this work should be done in international cooperation. We all know, if we want to make such tools for each document, we have to analyze these documents. I heard from Mr. Pfeffer yesterday that he thinks the analysis of one document, takes about five to six hours. Suppose the U.S. Patent Office has in its files six million of documents, the analysis of all the documents would take thirty million man hours, which means twenty thousand man years. In other words to analyze the entire documentation of the U.S. Patent Office, would lead to the fact that the Patent Office should be closed for twenty years and that its entire staff would do nothing else but analyze documents. You see, it is a tremendous amount of work and I hope that the six hours mentioned by Mr. Pfeffer can be reduced at least for the greater part of the arts involved.

But all the same, we all know that the U.S. Patent Office is by far the largest office of the world, and I myself, who am in charge of a small patent office, am sure, as you can very well understand, that it is quite impossible to fulfill such a task with my own means. And there are many other patent offices which are in the same position. I think that for that reason, it is quite necessary that we collaborate, at least if we wish to achieve our ends as soon as possible.

And in what way shall we collaborate? I have quite a few ideas. I do not know if these ideas would be agreeable to you and I do not even know if these ideas are agreeable to my own Government, but I thought that perhaps an International Committee might be constituted to work out a research program. Just as in many industries there is a board which is charged with making plans for research, in which all relevant questions can be dealt with, there could be considered for each art, which system is the best, and who should design a search system and test it and elaborate some plans as has been done already. That can all be coordinated. And it seems to me that this work of actual researching could be taken over by the several Patent Offices which are inclined to cooperate in this field.

I think that in this field if we do not come to a real international cooperation, perhaps the U.S. Patent Office may succeed on its own. But as to the small European patent offices, I seriously doubt that they will ever come to a result, and Mr. Moderator, I should appreciate it if you would be kind enough now to discuss the possibilities of such an international committee which, after establishing a research program might be followed by further research in coordination between several patent offices. Thank you very much.

Mr. Glaser: Thank you very much, Dr. de Haan. I believe the Assistant Commissioner, Mr. Fay, has a few words he wants to say before he has to rush off to somewhere else. Then we will throw the floor open for the discussion of the suggestion we just had from Dr. de Haan.

Chairman Fay: Thank you, Mr. Glaser. We do not have to rush off that fast. Dr. de Haan has said he would like to listen to the discussion about his proposal, so that we will stay until the coffee break.

First, I want to introduce to you some people from the Patent Office whom you may not have met. First Assistant Commissioner, Edwin Reynolds, Mr. P. J. Federico, Examiner in Chief, Mr. George Roeming of the Solicitor's Office.

I think we can all agree that this workshop has been worthwhile in one way or another to most of us. While some other work assigned to me, did not allow me to be here regularly, I have observed a genuine enthusiasm for the work we are doing here, among the various representatives present. I know that we have learned from each other, and I trust that what we have learned will be useful to each of us in helping us to approach our own information retrieval problems more intelligently. I would like to add my special thanks and appreciation to the speakers who have led our discussion groups and who have presented the material upon which we have based our discussions. I think we can all readily agree that the presentations were both stimulating and enlightening. Finally, before closing, I would like to voice the hope that we will have many more of these Workshop sessions in the future Mr. Knight of the United Kingdom, in his presentation on Monday afternoon, quoted to us from a report which stated that these workshop sessions themselves are helpful in solving our information retrieval problems. I agree with that statement and I would add that the information gathered in the workshops, such as this will prove only as valuable as the use to which we put it. I trust that we will have at least, begun to understand our information retrieval problems through discussions here, and that we may have future opportunities to meet and continue this work.

Mr. Glaser: Yes, Dr. de Haan.

Dr. de Haan: Mr. Moderator, I just spoke about abstracting. I should like now to talk about thoughts that have not been written down or said. I mean, the thoughts, I am quite certain are now in the minds of your foreign guests. We have all greatly appreciated this invitation to attend the Workshop. We have especially appreciated the way in which these discussions took place; the open and unprejudiced way in which you Americans face the existing problems and the clear and very matter-of-fact manner in which you deal with them. I think it has been for all of us a revelation to be here, and to cooperate in this very nice atmosphere of friendship.

And then I want to thank you, too, for your real generous hospitality on all occasions. Thank you very much.

Mr. Glaser: Thank you, Dr. de Haan. I shall see that your words are communicated to those who deserve them. Now I take it we are still a parliamentary, unparliamentary organization without a charter, now about to discuss the suggestion that Dr. de Haan made for the formation of some sort of international cooperation committee, in order that we not lose the advantage of having discovered who each of us is and what our interests might be. I would, therefore, like to hear from those who are attending, especially the representatives of countries other than the United States, initially, to see what they think ought to be set up, what degree of formality, how it might be organized, and so on. And, of course, also to address themselves to the question of whether or not there should be such a group, which is, of course, the proposal that Dr. de Haan has made. I then throw the floor open for free discussion of this suggestion. I suppose it would be appropriate to ask first of all whether anyone thinks this is a poor idea and would like to speak against it. This is the easiest way to get an argument going. If no one rises to this, I shall assume that everyone present thinks that the basic suggestion is a good one. I will entertain any comments anyone cares to make about how it ought to be organized and how it might operate.

Mr. Jancin: I think it is a very good idea. However, I think that you almost need a committee to formulate the committee. In other words, this is something that probably should be discussed by a nucleus of people to develop a working international committee.

Mr. Glaser: A very sound suggestion. I do not want to presume on the usual privilege of the Chairman to appoint committees because my position here is already so tenuous. I do not know quite on what authority I have this chair, and we ought to proceed that way. However, if there are any comments to be made here in the open meeting, this is the right time to make them. If not, we will simply have to discuss as informally as we can, the arrangements under which we might set up such a committee and see that we maintain the lists of the identification of the people who are interested in this work, and who occupy positions of responsi-

bility in the various countries, and that we exchange documents, and so on. However, aside from the fairly obvious things that such a committee would have to do, if anyone has any suggestions about how it ought to be set up, how it ought to be organized, who ought to be on it, or anything else, the floor is open for that. Yes, Harold.

Mr. Pfeffer: I would like to suggest that the visitors who are here today consider themselves as constituting an ad hoc committee to further discuss this matter.

Mr. Glaser: Do we have any comment on this suggestion? If not, we already have a committee.

Mr. Jancin: I would like to go a step further and suggest that all of us give this some thought and possibly direct our remarks to a single person that you, Mr. Glaser, as Chairman, might designate at this time.

Mr. Glaser: Yes. Let me suggest that Harold Pfeffer, who is in charge of the Arrangements Committee of this conference, be the person you can address. This gives us at least someplace to which we can send our remarks. If you simply send them to Harold Pfeffer, United States Patent Office, I am sure he would get it. Meanwhile, I suspect that before any of you get too far away, we will be a little bit further along on the organization of such an ad hoc committee. Is there anything further? Yes sir.

Mr. Rockman: I think one of the first things we should do is to get the committee together to find out what actually has been done in each of the various countries—Australia with her 26 different arts, the United Kingdom with their system, and find out in each country which art actually has been developed, to what degree, and the means used to get a set of descriptors. I think that would be a start to combine all this actual knowledge we have now, use that for a springboard and go on from there.

Mr. Glaser: If I may apply the rules of legislative construction to what you said and take everything literally, I do not think it is practical for the committee to get together and say in detail what each of them are doing, since this would occupy a great deal of time. I think, however, the committee might very well arrange to accumulate these things in some useful form so that they can be sent around.

Mr. van Waasbergen: I think, Mr. Chairman, that these days have made it clearer that many people do not know what other people are doing. There is an exception for what you in the United States are doing because you have, in a magnificant way, published about 20 reports, which were available, I think, to everyone else. But we at The Hague, for instance, know very little about what is being done in Stockholm, even in London, and Munich, towns which are not so far from us. I think one of the first things which we should do is establish some means of comunications from all interested people to all other interested people.

Mr. Glaser: This suggestion has so much merit I will not even open it for discussion, but simply regard it as one of the instructions to the ad hoc committee, if that satisfies everyone.

Mr. Koller: I should like to suggest that the ad hoc committee and the temporarily designated secretary, that is the representatives of all of the visiting patent offices, with Mr. Pfeffer, get together and try to find some time to meet either in the rest of the day today or sometime tomorrow and try to arrange either for the establishment of a temporary secretariat for the international committee or some point at which some next meeting or some next formal communication could be had. I think it would be well for them to get started at least in this formal way before leaving these grounds.

Mr. Glaser: Again, I think this has sufficient merit so it should be regarded more as an instruction than a question for debate. Mr. Fay, did you have something you wanted to say?

Chairman Fay: Mr. Glaser, on behalf of Commissioner Ladd, I think we should be glad to act, if this group should so ask us to, to appoint a tentative or a temporary chairman for a committee and see if we could not, at least, begin the organization of something which could be considered at a subsequent meeting. We could prepare policy, through the committee, which would suggest a structure that might be available for a subsequent workshop. I think at this time in this workshop, it is a little late to put together a committee that can come up with very much policy now. We could do this in the months to come. We would be glad to centralize any information you would like and to assume to appoint a chairman temporarily, if the consensus of the group here would like us to.

Mr. Glaser: What is the wish of the participants from the other countries with regard to this suggestion.

Mr. van Waasbergen: Mr. Chairman, would it be perhaps a good thing to ask which people will be in Washington tomorrow afternoon.

Mr. Glaser: Yes. How many of the delegates to this organization will still be in Washington tomorrow afternoon? We will have a show of hands. Well, not all, but quite a few will be here. Do you want to say anything about this tentative arrangement, Harold?

Mr. Pfeffer: All the representatives will be present for the meeting tomorrow with the Commissioners. Perhaps sometime, either before or after the meeting, we may be able to consider the organizational problem.

Mr. Glaser: I think the first step will be taken then at the meeting tomorrow with the Commissioner. I take it that the American Patent Office proposal volunteered a certain amount of secretarial service (this being not a trivial thing in the organizing of a new effort) somebody to keep mailing lists, to see that things are reproduced that should be, and so on. I take it you are speaking for the Commissioner in offering this, Mr. Fay.

Chairman Fay: I think so. I think we can discuss this proposal tomorrow, after the other subjects are terminated.

Mr. Glaser: Fine. Well I think that does give us a way to move ahead. Does anyone have anything further by way of instructions to the committee or comments on the proposal that might be brought up at this meeting while we are all here? If not, I think that concludes this part of the program. We are a little bit early for the coffee break, which is good because we have three papers yet before the conference, which will be read in the second session this afternoon and will complete the conference. Needless to say, it is perfectly proper during coffee break to corner people and tell them what you think about this organization. That is what coffee breaks are really for.

A short recess was called by the Moderator.

Mr. Glaser: We are ready to resume for the last session. We have three papers of substantially different content remaining yet in the conference. In all three cases I know enough about the speakers to state that they could easily spend a long and profitable session on the topics that they will cover. In the merciless manner in which we must proceed, all three will summarize very briefly the kinds of research they are conducting and the results which they are obtaining. We will have first my colleague Russell Kirsch of the National Bureau of Standards, who is working on an approach to the Patent Office problem through formal linguistics. He will make his presentations now—"Theoretical Research on Information Processing Potentially Related to the Information Retrieval Problem."

Mr. Kirsch: I would like to paint a fairly black picture with one little ray of light in it, and suggest to you that it is largely your option to determine how much can be extracted from this little ray of light. The thesis that I would like to develop is that there is a good deal of work of a theoretical nature which although it is not immediately concerned with the information retrieval problem, can potentially be made to relate to the information retrieval problem. What I would like to address myself to, then is a consideration of existing research, predominantly of a theoretical nature, that, at your option, can perhaps be made germane and useful in understanding the information retrieval problem.

This is at your option for the following reasons. The kind of research that I would like to talk about is, in fact, going on at present and there is every reason to believe it will continue to be conducted in as effective, scientifically satisfactory a way as it is at present. There is no *a priori* reason to believe that this work will direct itself to the kind of problem that we have been discussing here unless somebody makes a significant attempt to show how it relates and to use whatever results are available. This requires at least two very difficult decisions on the part of those of you who believe that some of the things that I am going to talk about are related, or may be made to be related, to the information retrieval problem.

The first decision, which would have to be made in the affirmative, is whether or not to engage in the necessary training to understand the predominantly mathematical or linguistic or computational techniques that underly these particular theoretical disciplines.

The second decision which would also have to be made in the affirmative by the members of the international patent communities, is to attempt to abstract from your problems those parts which are fundamental, systematic, not chimerical, but consistent and repetitive from one system to another and from one time to another. Then you must communicate this abstraction of your problems to the

members of the scientific community in such a way that they can proceed to do something about it. That is also a very difficult task, but some of us have been addressing ourselves to it for years, with some limited success.

Both of these decisions, if made in the affirmative, are reasonably costly in time, in manpower and patience. I would like to suggest to you simply that the decision should be made without attempting to argue in which direction these decisions should be made. My purpose here is to present to you a description of the kind of research being conducted so that you will have a little more information on which to base your decisions.

First of all, there are many different versions of the information retrieval problem. I have identified a few in the past discussions. The version of the information retrieval problem that one works on is determined partly by the problem that one has. I have been very much impressed here by the great degree of similarity that there is in the patent office problems in one community and the next. But more importantly, the version of information retrieval that you formulate and attempt to work on is dependent upon your idea of what intellectual and mechanical tools are at your disposal.

I would like to trace very briefly the history of kinds of information retrieval problems that people have worked on with respect to the tools that were presumed to be available to them. The earliest kind of information retrieval problem was implementable with hand-sorted cards—the use of the set inclusion kind of information retrieval with descriptors is easily implemented in this type of mechanical vehicle. Consequently many people construe and some still do construe the retrieval problem—that is, their version—to be that kind which is implementable with such devices.

A somewhat more ambitious version of the information retrieval problem presumed implementation with punched card machines. A still further and perhaps more ambitious version of the information retrieval problem presumes to make use of the calculating power of electronic computers and here we find such versions of the retrieval problem as statistical analysis of texts for the purposes of auto-abstracting or perhaps it should be called auto-extracting.

There have been not only mechanical tools available, but also formidable intellectual tools. For example, many people in the past few days have been talking about the use of classification theory. There is a large literature on this theory. I just mention in passing the use of statistical analysis of a sophisticated kind, easily implementable on electronic computers or even on some punched card machines.

I would like to continue the survey beyond here and ignoring those things that I have just mentioned, tell you something about other tools. My own particular familiarity is mostly with electronic computers. In trying to use electronic computers over a period of years for various problems, in particular the information retrieval problem, it has been my own personal experience to discover that we know very little about these machines and very little about their use. Consequently we must develop considerably more insight into these machines and their methods of use and into the methods of characterizing the information that they process in order to attempt to do anything of a significant theoretical nature with respect to the information retrieval problem.

Let me talk a bit about some of these tools, both mechanical and intellectual, which are at present available and which you might perhaps be able to apply to the information retrieval problem. I should re-emphasize that none of the tools I am going to mention have been used in any significant practical way to solve any parts of the information retrieval problem. That is not coincidental. I selected just those tools which have not yet been made practical use of, because I presume that you gentlemen are eminently aware of practically available machines and practically available tools. So let us discuss some of the more esoteric tools.

First of all, there exist today fairly sophisticated programming languages. The programming language is an artifice invented by the computer programming profession to make its job easier. People have been writing instructions for computers for over a decade now, and many people who have been doing this were not only disturbed by the difficulty of their task, but ingenious enough to use the very machines to which they were addressing their instructions as vehicles for making their own jobs simpler. As a result of the kind of investigations that have consequently grown up in the computer programming profession, there exist today very powerful, formal languages, artificial languages, invented predominantly by computer programmers, which have a very powerful descriptive capability of describing computer processing operations.

More recently, programming languages have been developed which have a more general area of appli-

cability—that of manipulating general arrays of symbolic information, not necessarily numerical and not necessarily for the purpose of instructing computers. So we have today in existence such things as the symbol manipulations languages called LISP and IPL–V and a few others, developed in various places. A rather interesting one which is in the early stages of development right now is the so called "Advice-Taker" of McCarthy and Minsky at MIT. The purpose of this language is to facilitate the possibility that the operator of the machine might give general advice to the machine about a particular task, which consequently would enable the machine to perform the kind of inference necessary to perform very elementary tasks of a non-numerical nature.

Another kind of tool of a more mechanical type that has already been implemented is the class of picture processing techniques that some of us have been working at. We do have in existence today the ability to feed diagrammatic or pictorial information directly into machines. That is, there exist devices which can scan an actual picture and copy that picture in a rote fashion into a machine. The possibility then opens up, and it is at the moment not much more than a possibility, that one might write instructions for such a machine to enable it to make this rote-copy photograph and characterize it by doing such things, for example, as counting the number of resistor symbols or finding out whether there is a parallel tuned resonant circuit in the plate circuit of a vacuum tube oscillator in electrical circuit diagrams. This has not yet been done.

Notice, I am mentioning this not as just a remote possibility. The fact that I mention it indicates that there are some people who are trying to achieve it.

Moving over to the more intellectual tools that are available—those which have not been implemented in any form of hardware, we have the whole tradition of Descriptive Linguistics. The linguistics community has attempted for a long time to find out what is systematic about language, and it is taken as a basic predicate in the linguistic community that language is a very systematic phenomenon—a phenomenon that can be studied the way any other physical phenomenon can be studied. It happens, unfortunately, to be a very complex one, but we now have the ability to describe in particular to machines, very complex phenomena and the ability to exchange these descriptions through the artifices of programming languages.

There are now investigations in descriptive linguistics which are particularly concerned with such things as automatically characterizing the syntactical structure of, say, English sentences. That is to say, given a set of words, there are in general, very few combinations of those words that form sentences in any natural language. The vast majority of them will not, and the attempt to elucidate these constraints and to exploit them, in particular for such things as information retrieval, is the job of the syntactical analyst. There exist computer programs now which can do very elementary kinds of syntactical analysis on natural language text. It turns out that the size of the task is such that the number of rules one might need to describe the structure of a language, like English, could possibly be comparable to the number of words in the language itself. That is a rather sobering discovery if it is true.

More than passing mention should be given to the subject of Mathematical and, in particular, Symbolic Logic. Two things come to mind here in the way of investigations that have some potential applicability to the problem at hand. The logicians, and more recently the computer users have been concerned for some time with the following rather fundamental question: what can and what cannot, in principle, be calculated by machines. It turns out that this is not a very new question. Its earliest version in the recent literature dates back to the early 1930's, and about something over a half dozen investigators have independently attempted to characterize this problem and to propose mechanisms which they thought had the general power to calculate all that can be calculated. These mechanisms have turned out to do exactly the same class of things—to have the same general calculating power. This suggests the very powerful thesis of Church that what these mechanisms can calculate is all that can be calculated, no more, no less. Consequently, a study of this class of devices—devices which can calculate the so-called recursive functions—might, in fact, be a proper study for one who wants to know what machines can do and what they cannot do in principle.

Another important kind of investigation in the field of symbolic logic which dates quite a bit farther back, is the attempt to formalize within formal languages the inference process that we perform in natural languages. People have attempted over a period, at least as far back as the 1800's, to represent within the language of formal logic the assertions and the inferences made by a speaker of a

natural language. Interestingly enough, there is some reason to believe that this quite unsolved problem has remained unsolved because the complexity of the problem is such that a solution could only be implemented with something of the complexity of contemporary machines, which suggests why the logicians of past decades, although they had considerable insight into the problem, might not have been able to create the solution that they were looking for because in this case the necessary mechanical devices, electronic computers, were not available to them.

There are questions being asked in the field of Automata Theory. For example, how one can design them efficiently in a sense that is independent of the particular device used for constructing them, and what kinds of strings of symbols specialized machines can produce or analyze. A rather extensive literature in this subject of Automata Theory has developed. An interesting recent development in this area is the possibility of machines which can in some sense organize themselves to perform very, very elementary tasks. This is a highly controversial matter at present.

This leads me to the last and by far the most controversial subject, except to those engaged in such research—the subject of Artificial Intelligence. The earliest question asked in this area was asked by the British logician, Turing, when he asked whether machines could think. I certainly will not attempt to offer any opinions on that subject because one immediately becomes involved in controversies over what is meant by thinking, what is meant by intelligence. One finds interestingly enough that as each little problem in this area becomes solved, it becomes generally agreed that that is not of course, intelligence. So, the goal of intelligence manages to continue escaping us, but just by definition. I might mention to you some of the things that are being done in the area of artificial intelligence. There are pattern recognition devices which can read printed characters, and there are investigations concerned with very much more complex kinds of information for example, electrical circuit diagrams.

There are investigations in the artificial intelligence area concerned with problem solving, the intention here being to attempt to model in a functional way the kinds of processes carried out by human beings when they perform such tasks as proving theorems in elementary plane geometry, proving theorems in logic or solving very simple creative tasks. It has been shown quite convincingly that one can program a machine to exhibit a problem-solving behavior, at least superior to that of the person who programmed the machine. For example, one investigator has programmed a machine to play checkers against himself and to beat him. Others have programmed a machine to prove theorems in plane geometry, and, in one case to exhibit a very ingenious new and creative solution to a single geometry problem, one which I believe no high school student had previously come up with, even though it is self-evident as a beautiful elegant proof, once you see it.

In the area of artificial intelligence, there has been a great deal of interest on the part of many people for some time, in the subject of game-playing machines, such as the checker-playing machines. There is a great deal of active interest in the possibility of programming a computer to play chess. There is no chess playing program in existence today which compares in ability with the checker-playing program that I mentioned. And that is simply a reflection of the fact that chess is a more complicated game.

Finally, still in the area of artificial intelligence, I might mention investigations that people have been conducting into the subject of inductive inference—how we might get a machine to deduce consequences that do not strictly follow with respect to any ordinary deductive systems—consequences that follow, but in an inductive way, from certain premises. For those of you who are interested in the fine delicacies of this question, it is evident that once you write a program for carrying out inductive inference, then you have formalized this process, and you are doing nothing more than carrying out deductive inferences. You might say that the main goal of people in the artificial intelligence area is to take all these problems that seem unformalizable and to trivialize them by making them formalized and by attempting to show that they can, in fact, be solved very simply. The ubiquitous phenomenon is that once we have solved a problem, it certainly appears simple.

I could elaborate greatly on the technical details of some of these subjects but instead I would reemphasize the fact that all of these investigations are being carried out generally by highly competent scientific researchers. The results of this research are generally communicated very effectively through the usual vehicle of scientific publication. They are, of course, available to the international

community. The results arise in every nation of the world and, at least with respect to this aspect of research, the mechanism exists today in a highly developed form, for communication and cooperation.

Again, I should mention that for those of you who are concerned with the possible automatization of patent searching, with patent analysis, with the patent issuing process, the option is available to you to become sufficiently familiar with some of this highly theoretical research to be able to decide whether or not to engage in this research or perhaps to follow it closely, so that the option will thus become available to you to help influence its direction in such a way that its eventual application will be in the area of the patent problems, rather than in other areas chosen by the people conducting this research. This option is available to you and is a costly one. It offers the very enticing prospect that we will be able to do what any good scientific investigation enables one to do, namely, to accumulate experiences that the second investigation may build upon the results of the first investigation, so that the consequences become more and more profound as one progresses in this area of scientific research. Thank you.

Mr. Glaser: When I said that we proceed at a merciless pace, I did not mean it was merciless on the speakers. They are used to it. It is merciless on the audience. There was an indecent amount of material covered in this talk, of course. I hope that when the proceedings come out, which is not too far away, those of you to whom most of this material is new, will have a chance to look it over and study it a little more in a little more detail. What Mr. Kirsch was speaking of, of course, is the under-current of growing technique and theory which we hope will define the eventual achievement possible in these kinds of problems. We will, however, try to rush the proceedings into your hands so you can look at these things in a little more detail and see in what context for example that thing he said about proving Euclidean theorems came up.

We now have another, I am afraid, unduly brief presentation by Larry Heilprin. The title given this presentation is "On International Collaboration for a Complete Information Storage and Retrieval System." Dr. Heilprin has his doctorate from Harvard in physics under the well-known physicist, Professor Bridgeman. He was at the Bureau of Standards for ten years, so you see we people from the Bureau seem to sneak into the program in various ways. He is now at the Council for Library Resources, Incorporated, which is, in itself, such a complicated story that all I will tell you about it is they somehow seem to be able to get some money to give to people to do research. This is a very useful function. Dr. Heilprin has about 20 minutes, I think, to make his formal presentation. We will ask everyone to hold questions until the end, so that those who must leave at 5:00 o'clock will at least hear the three presentations. Larry, the meeting is yours.

Dr. Heilprin: Ladies and gentlemen, what shreds are left of new things to say I will try to compress. Almost everything that I had to say has been partly said, but I would like to, shall we say, take off at the point where the preceding speaker left. Only, my interest is somewhat different from his. I am interested in the basic philosophical background of the whole picture. And I would like to place big canvasses, and of course sometimes I get mixed up in doing this.

The first thing I will do is to indicate what I think is a complete information retrieval system. If we take the two types of communications which exist—the so called short duration communications which last up to a few minutes, and which employ time-modulation principally, and the long-duration communications which, in order to endure anywheres from a few minutes to many years, employ solid media and spatial modulation, we immediately have a spectrum in which the path of propagation of all communications is broken up into two parts—a short part where the time axis is quite small for the s.d. or short duration, and all the rest of space and time for the l.d. or long duration communication. Now that is the one with which the documentalist is concerned—l.d., long-duration communication. That is my first picture.

Secondly, the fact that this time axis extends indefinitely means, of course, as we have all realized, that the mind that puts the initial modulation down may not necessarily be contemporaneous with the mind that decodes it at the end. And this is the principal problem that makes long duration communication a very specialized kind of thing as compared with what we ordinarily call communication engineering. It is far more complex. It has all kinds of different, shall we say, occupations, from writing to publishing, to operating libraries, being a documentalist, running specialized retrieval systems, such as patent offices, and so on.

As a background for this paper then, we have this long duration communication and we have mind to mind communication in which there are a set of main stages or states through which the l.d. message passes. And I want to point out that what we call a library or a patent office is simply a sub-set of these stages, of the paths of propagation in four dimensional space, that the inputs are not controllable in the sense that the internal processes are. Well now, having talked somewhat vaguely like this, the title of this paper could apply to this larger system. It could also apply to patents only, and what I want to do is to fit the patent picture into the larger picture to show how tremendous the big problem is and how somewhat more simplified is the smaller picture for the patents. And finally I want to bring it around to the point of international collaboration.

We have talked about a complete system, which means from one mind to another, in my definition. Now, in another paper which has not yet appeared, the American Documentation Institute is getting out its version of what documentation is, and this is the general picture. The documentalist is a communications engineer-long duration communications engineer—whose function it is to get these messages from the sender to the recipient and he does so using any means whatsoever that he can. But in general, these means break up into two channels—purely physical, or shall we say, mainly physical means, such as carting books around and putting them on shelves and marking them and binding them, and mainly intellectual tasks, such as classification and reference work, and searching ideas.

Now if you break up a library into a flow diagram and do not insist upon a single flow diagram then it would look something like this. I would say here is your mind No. 1 and here is your mind No. 2 down there. We have some intermediate stages, and then we have a library which is equivalent to, we will say a patent office system which is a specialized library, and we will have two lines of flow. I'll make it terribly simple, by calling one the intellectual processes, and the other the physical processes. The latter will be to collect and to store and to disseminate, and their counterparts in the intellectual processes are acquisition, search, and reference. Now they are not all straight though. In fact, there is a loop in a library, between distribution and store, as you know when you return a book. And I am merely suggesting that a library has a set of tasks which are primarily physical and it has another set which is mainly mental. Now the physical tasks center around the enormous growth of libraries or patent offices, or shall we say in general, these l.d. messages. It is very common to use the expression "they are growing at an exponential rate". However, as any of you know, if the exponent is small enough, the curve can be flat or it could go down. So the use of the word exponential means nothing. What is meant by exponential growth, of course, is that the exponent is large. And we might say that these libraries are growing something like this, $*N = N_0.e^{\beta t}$ where β is some respectable quantity, and the time in order to double is on the order of anywheres from 5 to 25 years. Some big institutions, such as Harvard, have about 17 years time to double.

Now here we have two channels for the library, and the question is, for the immediate future, not for the remote future, where in those sets of very big and rough classes of operations would you be able to, shall we say, apply the methods of systems analysis, operations research, automation, and real payoff in mechanization. Where could you in that system? As Mr. Kirsch has pointed out to you, there is in this flow line practically no existing hardware. There are wonderful experiments that are being performed, but nobody has done anything yet that actually pays off in the sense of large-scale operations. Therefore, I would say, if you want to make a broad generalization, that the first line of flow for all the intellectual processes cannot at the present time be automated. This is a very sweeping statement, and I know that there are many people who would like to take exception to that. Nevertheless, I am saying it, with the saving phrase, "for the immediate future". Therefore, I believe that automation of a large-scale system, such as a patent system, and eventual world collaboration, for that matter, if we are talking about automation, will have to stick to these physical processes. Now these physical processes—the first one, "collection", is linked to the preceding stages that come from this line, maybe a publisher or distributor, and so forth. It would be pretty hard to automate the process of "collection" because you would have to change the way publishers act and the way the mailman delivers, and so forth and so on. So, my picture of where automation is going to take place and can take place is in the mechanical or physical aspects of storage and dissemination. This is where, also, the greatest hardware advance has been made that is either actually now here or very close to completion. As you all know, there are a number of systems that are coming into being. The first

one of course is here—the Minicard system. Magnavox has a fine system, and IBM, of course, has announced its Walnut system. The AVCO Corporation has developed a store and dissemination, but without the brains that go into it—that is to say, you can use anything from a card file to a computer to find what is in it. However, they have combined one-second retrieval with great scale reduction. They can get a million pages into about a cubic foot or more. In general, there are many other devices that I am sure are as good or better. I am simply saying that in this area there is hardware for storage. Secondly there is hardware that is available for copying and rapid dissemination, which will solve the problems, for instance, of Mr. Hurd of this Office. How is he going to disseminate 150,000 patents per day or something like that of which only 10 percent goes to the outside and 90 percent goes to the examiners themselves.

Dissemination methods, then, can be automatized. So, now we have a picture of, shall we say, a single one of these units, and the most likely area. Certainly, I am not saying that something may not be found here by Mr. Kirsch or others that will completely revolutionize this—some automatic indexer or something. But, right now, I would say, those two areas which I have indicated are the places where some real progress will be made and where it is about to be made. Now, what will happen? Supposing that we take as an example the system that I know about the best—the AVCO system, where photo storage is used. Instead of physically translating a volume out of the library and bringing it back into the store, we will eliminate the loop between distribution and store and it will be a straight through system, in which the price of the copy is below a certain economic threshhold—namely, it is dispensable. This is an idea that is very common. Nevertheless, it is true that the cost of the l.d. message has gone down in history since pre-historic times. If I may draw in the air, if this is the time axis, and this is the present, and this is the cost in man hours of enscribing the number of bits in a modern book, and we use some sort of a log scale, the price would be pretty high if you have to enscribe that book by chiseling on a rock, or even on bone or even if you got it down to paper and did it on paper or papyrus or a scroll. The human labor of scrivening and writing would be so high that over thousands of years this cost would fall very slowly. Then it fell sharply when we had movable type. But the cost of that book in man hours has now crossed an economic break point in two directions. The first one, of course, we are all aware of. In order to see what that point is, let me go back. The cost of circulating this loop is now calculated by librarians to range from $.25 per circulation to $1.00, something like that. There is a tremendous amount of cost in charging the thing out and charging it in, keeping records of who has it, finding out what is happening, who lost it, how much they owe, computing it, chasing after them, replacing the book when it is lost, and so forth. There is a corresponding loss by the user, which is, of course, loss of time and accessability. At any rate, this loop will be eliminated and the user will have a "D" Library, as I call it—a duplicating library, as against a circulating library. And, in fact, the library merges with the publisher, because the publisher who now stocks a huge inventory can do the same as the library. He can have a single master copy as Mr. Hurd, I hope, will some day have, and he will duplicate beautiful prints of patent number 2976 and so on, which he can retrieve because it is a beautiful serial number, and all he does is punch that on a paper tape and out come the six sheets. On demand publication.

The publisher may say, in self-defense, "I will also be a librarian. I will also stock my books." And he will also issue them on demand, and he will no longer have to have the cost of inventory of tremendous numbers of books that have to be kept in a warehouse. So, I would say that the future, then, of the library and partly of our patent system, is a compression in which we will have publication on demand, and this is all in the physical realm.

Now the cost of the intellectual work, which I believe is the thought that Dr. deHaan had, the actual sharing of the classification work so as to bring it about and make it uniform throughout the world, is very much greater than this. A breakthrough probably is not yet in sight, and while I personally feel that I would like very much to participate in pushing this effort, I would say that for the immediate future, its hope of getting standardization enough to really help, is somewhat more remote. But possibly computer methods and programming, and so on, may do it.

I had a lot more to say. I won't say it.

Mr. Glaser: The final speaker in this session is going to address herself to a problem that has come up very frequently in the conference. It is that of automatic reading and picture recognition. I could tell you a great deal about Mary Stevens, but the thing

you want to know now is that she has just finished a report on this subject for the National Science Foundation. We will see to it that one of the first acts of the new, informal committee on international cooperation will be to mail each member of the ad hoc committee a copy of this report, which is just available now. Mary Stevens will now summarize the present state of the art in mechanical reading of characters and of pattern recognition. Mary Stevens of the National Bureau of Standards.

Miss Stevens: Well, the report contains something in the order of 75,000 words, and to recapitulate this would keep you here far longer than your planes, trains, and so on, would permit. Therefore, I shall try some short cuts and will try to cover as much as I can to give you some idea of what we think the current state of the art in automatic character recognition, in fact, is. I think I could summarize best by saying that the current state of the art in automatic pattern and character recognition is in a "4–F status." For the benefit of our internationl visitors, I might explain that 4–F is one of those classification terms that got assigned to draftees who were not accepted because they were considered unfit for military service. Well, our 4–F status as far as character recognition is concerned, does not mean this. I will describe these "4–F'S as being *F*iction, *F*allacy, *F*act and *F*easibility.

Let me start off first by saying that it is a *fiction*, I think, to consider that automatic character recognition is not ready for service. And it is a *fact* that in limited circumstances, under controlled conditions at least, character recognition is ready for at least some limited service. Now the other aspects of the fiction F, like the output of popular fiction, with which information retrievalers are not as yet concerned and perhaps hopefully never will be, ranges the gamut. The pessimistic school, such as that of the Southern sharecroppers living in misery, is represented by those who say, "Oh well, mañana—five years from now," and they sit back, shall we say, in the squalor of the present rather clumsy methods. Then there is the existential school. You know, this is the Doubting Thomas: "Until I see it for myself and until it happens to me, it does not exist." Then there is another school which is just as mistaken in its own way, and that is the optimistic one—the romantic kind. This is the school that says the punched card is already obsolete. Well, whether the punched card ever will be obsolete is a moot question. There are, however, as I hope we will see, situations where certainly there are other techniques that may be preferable and may indeed be economic.

The *fallacies* that mark current progress in the field include an apparent fallacy on the part of many potential customers who seems to feel that it is necessary to solve the problems of reading cursive handwriting before one can even consider applying machines to the reading of type and printed text. This is a fallacy. It is a fallacy because, for one thing it, overlooks the fact that certain elaborate costly computer programs can already succesfully read human hand-printed material almost an well as human beings can. In other words, the cases where the machine is confused are almost precisely the cases in which human beings seeing the character out of context would be equally confused.

A second fallacy is what we might call the superman fallacy—the potential customer says, "This is all very well but I cannot afford error rates or reject rates such as you tell me would be necessary; I cannot afford more than one error in a million characters." Now, what does he live with today? Even in banking operations, he lives with two errors in 10,000 after verification of punched cards, according to an independent survey made by Stanford Research Institute, when it was embarked on the ERMA program. When we are asking for a machine to go 100 to 200 to 300 times faster than human fingers, at a cost that is commensurate to 1/100th to 1/200th of the cost, why should we also ask the machine to be more accurate by a factor of 10 or 100? In other words, the fallacy here is to expect this superhuman accuracy rate when, in fact, we can live with no worse than we get today and still make money and gain time, and also provide a consistent kind of output that is easy to check.

The third kind of fallacy has at least a grain of truth in it. It is that optical character recognition may be considered the Cinderella of data processing. The fallacy arises, however, in assuming that this Cinderella means Cinderella in the sense of waiting for a fairy godmother. Rather, the Cinderella that optical character recognition represents today, is Cinderella waiting for Prince Charming to come and bring the slipper which sure enough, her dainty foot will fit. So, to turn to *fact* then, I think that it can best be illustrated by the ceremony held under the auspices of the U.S. Patent Office several weeks ago, in which the 3,000,000th U.S. patent was issued. This patent was for a reading device! The choice was deliberate; the applications likely to be processed at the time were care-

fully considered, and that particular one was chosen which was believed to represent the greatest impact on the American public, on industry and on government. It was for a device to read magnetic ink—and most American citizens by now are thoroughly familiar with this on their personal and other checks.

Actually, the magnetic ink field is the one in which there has been the greatest practical use made of automatic character recognition. Technically speaking, however, within the same limitations of highly standardized and not very elegant characters and of just the ten numerics and four special symbols, it is just as easy, just as economic, and so on, to do this recognition optically as by magnetic techniques. The reasons for the choice of magnetic ink relates to other characteristics of checks, such as the fact that people spill coffee and stick their chewing gum on them. You need to read through considerable obliteration.

Another *fact* in optical character recognition is that there have been a number of deliveries of working devices. There are some four of five companies here in the United States that have delivered a production model, and at least one abroad—Solatron. The pioneer in this field with respect to deliveries, Farrington Electronics, formerly IMR (Intelligent Machines Research) has over 50 machines of various types in customer use, and these range all the way from specialized numeric font machines to a page reader. There is a teletype reader delivered by Farrington that is being kept so busy in a communication center that the research staff who ordered it have hardly had time to look at their "baby."

More significantly, since the completion date of May 1961 for the report which covers, or at least mentions, some 160 different equipments, simulations, ideas, patents, and so on, many developments have occurred. In the last month or two for example, a colleague and I have visited some of the possible suppliers, and we are reasonably confident that within the next few months we will receive favorable responses to a bid request, not for research and development machines, but for service bureau type of contract. We would supply them a facsimile copy, photo or xerographic or otherwise, of a Russian journal, and they would deliver to us magnetic tape. The cost would be on a strictly service bureau basis—so much per word, so much per line, so much per page. We expect at least six companies could respond to such a bid request.

Where you can define your specific requirements, where you are willing to settle for approximately the accuracy that you get with keypunch operators today, where you can assure that the quality of the input material will be good and will be quite consistent, the *fact* is that optical character recognition is with us now.

Now, *feasibility,* the fourth F, means that there is available equipment for specific special requirements and for realistic performance specifications. That does not mean, as yet, that there is a universal reader which can read anything it has not seen before. It is quite possible that this will never be the case. But a second aspect of feasibility is that there is very promising research indeed, not only in terms of more generalized machines, but also in terms of the broad area of pattern recognition, which will extend to graphic shapes, to diagrams and potentially, we hope, to at least simplified pictures.

Now, briefly, how is automatic character recognition acomplished? There are a number of techniques described in more detail in the survey report and in many other accounts in the literature. The oldest technique in point of time of proposal seems to be the idea of a photographic negative image which is transparent—clear where the A would be and opaque elsewhere, and similar masks for the other characters of the alphabet. When the character image is presented to the machine, it is reflected in such a way that the black on the paper is superimposed on the transparent part of each mask. In exactly the one case where the character is found to coincide, namely, when the A mask is being looked at, there will be extinction of light to a photocell behind it. We thus recognize A. If we show this A mask to an input character B, there will be white coming through in some areas. When we couple this kind of negative mask with a reversal of the image or positive mask, we can determine many things. Note that for such characters as Q and O, if the character is not well-formed, the tail of the Q may get lost. For this reason then even in this so-called photographic template technique, many modern versions use a form of weighting. They consider the blackness or the whiteness in certain spots much more critically than in others in order to arrive at an improved separation criterion.

In another current method, the image field can be split up by scanning techniques which in effect divide the field into a number of discrete cells. And we can require that for any cell, if 50 percent or more of the area scanned in that cell space is black, we will consider it all black. Now again we can, in effect, use a template for recognition.

We can simply say that for these cells considered as elements of a matrix, cell one, the first row, the first column, must be black or must be white for a given character. We can do this for all the cells that might be covered, or we can do it only for selected cells that are systematically chosen to discriminate between the characters of our alphabet.

We may do other things. We may divide the character up into zones or regions. Consider, for example, the field in which the character is. We simply scan this field vertically and convert any black we see in any one vertical scan into an equivalent wave form. If this particular vertical zone were seen as all white, we would have no "black" output. When we get to a vertical zone in which some black appears, we begin to pick up a little. Now in a succeeding scan we get quite a lot of black, and we would have a characteristic wave form that could be used to identify the characters of a small vocabulary. This technique, by the way, the characteristic wave form method, is that which is commonly used in most of the magnetic ink character recognition techniques.

We may also do other things. There is not time to talk about them all, but let me mention one that gets away from the fact that you have to have previously seen examples of the characters that you are going to recognize in these so-called template techniques. If you have a very thin input character A and your mask is for a broad A, obviously it will not recognize that A. If the A is an italic A, it will not fit either the photographic type of mask or the A which specifies the cells to be black and the cells to be white for the character A. However, if we do scan successive vertical zones and determine for a given segment that there was a continuous long black leg and that at some later point there were three short black bursts, we arrive, in effect, at what might be called a machine idea of an E. The example given here is called stroke analysis, but it is also true that similar techniques can be worked out in terms of enclosed areas "lakes," partially enclosed areas or "inlets", and other characteristics that tend to be invariant with certain types of characters, all of which we can call "A" or "E" in some alphabet or another.

This, of course, does not as yet help us with handwriting. I think the point to note, however, is that in many cases these techniques and others such as curve tracing or vector crossings, are not as important in determining practical feasibilities today as is the exact size of the vocabularly—the total number of characters you want to recognize and the consistency with which you can guarantee that they will be presented to the machine in "good shape"—or, contrariwise, the extent to which you are willing to take reject rates of 20, 30 to 40 percent. By the way, you can still make money. The reason for it is the insistence on good quality or a high reject rate.

When we look at a blowup of typewritten characters we see holes, smudges, filling in of closed space, and breaks in character strokes. When it comes to carbons, it is much worse. They are not clean, good characters. Nevertheless, typed material can be read if you will accept the higher reject rates. Again consider the human factor. In some tests that were made for the U.S. Navy on typewritten material prepared in the field by a variety of shipboard personnel, there was a high reject rate. It was around 33 percent. That sounds unacceptable. Actually, they could still make money with that reject rate. What is more important, however, is the fact that over 25 percent of the total input was tossed out on a manual sort. Why? The instructions to the typists said—"Do not make strikeovers." I wish you could have seen what they actually did. So a high reject rate is often the result of the simple failure of personnel to follow instructions. Sometimes they xxxed out the same character as many as three times.

We have thus taken a few quick looks at the "hows," of character recognition. There are many other techniques. There are intriguing methods proposed that go into the use of random operators of various types. Some of you may have heard or will be interested in hearing further about the Bledsoe-Brown ring technique in which cells in a matrix are taken at random. For a given number of samples, this pair or this triplet of randomly chosen cells is or is not black, and the procedure is repeated for other characters in the vocabulary. This can be applied to handdrawn characters. At MIT, work that is is along the criterial analysis approach—which I have illustrated in the case of stroke analysis and "lakes" and "inlets" has again been used on handwritten characters and this with a score in the neighborhood of 87 percent.

Curve tracing and topological techniques have been explored by Sherman and others here in the United States and by several of the Russians. There are many other "hows." The point is merely to indicate that there is a wide range of ways to recognize fixed, formalized and relatively standardized pat-

terns. These available techniques will not as yet help us recognize a configuration on an aerial photograph, where the exact geometrical or topological pattern of runways to identify an airport, may not be known in advance, where we will have to evolve rules for helping us to decide that over a period of time. For example, if there are certain straight lines joining at certain angles and certain configurations, maybe somebody should take a look at the original because maybe an airstrip is shown.

Possibilities for pictorial data recognition suggests some of the whys for automatic character recognition and the "why" of talking about it in an information retrieval conference. It is to be recognized that character recognition is an aid to input. As such, it avoids the question that was bruited about interestingly yesterday, whether we should have full text processed by machine or whether we should have human abstracting, because these techniques of character recognition can be applied to the full text if that is what you want and also to the product of the analyst's mental effort—what he writes down. And since various types of recognition techniques can be quite readily extended to graphic and geometric shapes, it may be that what the analyst writes down will be a notation that is more familiar to him than other codes that he might use. For example, he might use shapes or symbols familiar either in terms of circuit elements or chemical structure elements. This would be read immediately by a machine. It is also quite feasible, I think, to look ahead to automatic reading of precisely the kind of flow chart that Mr. Wolk talked about yesterday—that is, if he would be good enough to perhaps help us a little by making certain kinds of boxes squares instead of rectangles, so that we would tell them apart in the reading.

As a third possibility, beyond the text input and the encoding of the analyst's notes, however, pattern recognition provides a ready means for further experimentation and research. This means both for statistical analysis of linguistic phenomena in text and for the kind of exploration of picture processing technology that Mr. Kirsch touched on briefly.

In conclusion then, I think we can say that optical scanning techniques do offer and do promise immediate usefulness in some areas as aids. The research aspects point to what are really common interests in pattern recognition. The elements that make you want to choose this document and not this comprise patterns whether those elements are words, names, or the ideas expressed by them, or the way they come together in concatenation, or again the flow chart approach. Mr. Wolk, I think, points to the same idea, that there is a problem in pattern recognition whenever we want to search and to select, and these two areas of recognition and of selection can feed one another.

Finally, I think we need to realize, when we think of 7,000,000 patents, that human efforts themselves, either on the mechanical or the intellectual side, are not good enough if we want to move forward in mastering this exponentially growing stockpile. Therefore, we are going to have to increase the degree of collaboration possible between the man and the machine. Automatic pattern recognition techniques can help us to do this. The discussion on terminology this morning reminded me of the fact that at the National Bureau of Standards all sorts of inquiries are received. One day I picked up the phone and a gentlemen introduced himself, so and so from such and such a company, and he said, "I understand you people at the Bureau can tell me all about information "retrieval." I raised a mental eyebrow and we talked briefly. Actually, I think perhaps the term is appropriate. We are going to need to try—many are going to need to try—and this means the researcher and the linguist and logician, as well as the examiner and the attorney and the documentalist and the engineer. We are all going to have to try and we may have to keep trying and trying again. Thus all that can help us should be looked at seriously without forgetting the other point that has been made so strongly—the fact that there is a major part of the iceberg still under the water. The part under the water is, of course, the question of deriving useful meanings from messages, pictures, communications, and information of all sorts.

Mr. Glaser: Thank you, Mary. It would really be quite a problem, I think, to engage in any systematic discussion of the enormous amount of material covered by the three speakers in this last session. As is our custom, we will excuse those who have to leave at 5:00 o'clock because of fixed transportation arrangements. If there are questions on any of these papers, this is the time to entertain them.

Mr. Jeffery: I would like to set a problem to our character recognition expert in the hope that when we return within another few years, we might have the answer. That is, can we have a machine for searching picture trademarks? That is quite a problem in trademark offices. All we want to do is

to pick out pictures which bear more or less resemblance to the picture in question.

Miss Stevens: I think this goes to a question that we really had very little time to get into at all. That is the question of the research into the relatively invariant features of symbols or characters, that we, as humans, would call the same. It is the problem of recognizing the script A, the upper case A, the lower case A, the italic A, the gothic A, and so on, as all being A. By the same token, for your trademark case, you would want to recognize a bell as a bell, regardless of its size, its proportions, it position, perhaps in terms of other material and similarly, for all sorts of other things. This is in an area in which I would be perfectly happy if 50 percent of my searches could be done this way, and the rest would have to be done other ways. It is quite probable that present-day research could hopefully help you out on some 50 percent of the searching, in say two or three years, providing you are willing to pay the bill for research and development.

Mr. Glaser: We have now had a number of people who have had to leave. At the risk of seeming arbitrary, I would like to close the meeting formally, the rules always being that if you can catch a man before he gets out you can ask him a question. I think we have exhausted the members of this conference. They have been very patient to sit through a very long and demanding group of sessions. I think everybody's patience is much to be commended. This has not been easy on them. I would simply like to close the meeting now with a reminder that our foreign guests are to be welcomed at the Patent Office tomorrow morning, where the Commissioner has a program planned. I believe that all of you, both our foreign visitors and people in this country, will probably hear a great deal more of this ad hoc committee, as it goes into operation and starts to perform what I hope will be very useful services. Thank you.

The last session was adjourned at 5:00 P.M.

APPENDIX A

PLANNING A LONG-RANGE PROGRAM FOR MECHANIZED PATENT SEARCHING

Martin Kalikow
General Electric Company

Presented Before the Patent Lawyers' Club, Washington, D.C., October 24, 1961

Ladies and Gentlemen:

The patent system as we know it today is engaged in a life and death struggle—not so much from its external enemies, but more critically from its own internal information weight and faulty information digestive system. It has already suffered several minor heart attacks and will soon receive a mortal coronary if we do not find some way to improve its capacity for information absorption, circulation and selective retrieval.

The crisis is fast approaching! If it continues to take several years to obtain a patent; if the Patent Office becomes unable to find the best prior art in a large percentage of the litigated cases;—if companies begin to find it cheaper independently to re-invent the wheel than to conduct an expensive and unreliable patent and literature search;—in short, if the patent system, as a result of inadequate searching, should belatedly spew forth invalid property rights and should no longer be able effectively to function as a repository of retrievable scientific and technical achievement, it will deserve to be sent to its demise! The patent system is supposed to promote the advance of Science and the Useful Arts, not confound and stifle such advance by an impenetrable and engulfing volume of words!

But let us not despair. Words have gotten us into this mess, and words can get us out. By this I mean that the various ephemeral "ideas" of a patent that we may be seeking are locked within its words (and also within its drawings—but principally within its words). What must, therefore, be extracted, collated, compared, and otherwise manipulated by our machines is the "meaningfulness" embodied in these various combinations of 26 letters. And before we get into the meat of our discussions this evening, it is important that you have some understanding of the semantic structure of our English language. What our experience in the use of a "basic language" type code has taught us is that, just as the 26 letters of the English alphabet arbitrarily represent certain relatively basic and phonetically distinguishable sounds of the human voice, in this same way there are certain words in the English language which represent certain relatively basic and semantically distinguishable concepts of the human mind!—and this is true regardless of the specific language used,—whether it be English, French, German, Russian, or some other language.

In other words, just as there is a continuous spectrum of sound gradations which have been arbitrarily carved up by common agreement in accord with certain alphabetical identifications, so in this same way there is a continuous spectrum of meaningful concept gradations which can be arbitrarily carved up by common agreement in accord with certain word identifications. Complex words, which convey complex meanings may then be factored with some semblance of uniformity into their component more rudimentary (even though not ultimately basic) meanings. For example, the word "spectrophotometer" may be translated during both classification and retrieval steps into its component more rudimentary meanings represented by the words, "light, frequency, select and measure". However, the trouble lies not in the actual performance of any one of these translations from complex to simple words—each can be done by any intelligent mind quite readily. The great difficulty lies in the problems of consistency. The fact that no two human minds will make precisely the same translations of the same complex words, and that even the same human mind will not make precisely the same translations at different points in time.

Fortunately, it is just in this area of "consistency" that the more sophisticated machines can save us. Once a given complex word is programmed to be

translated in accord with a given semantic code into the storage of large computer, the computer will always make exactly the same translation whenever that same complex word is encountered thereafter. If experience should indicate that the translation was not accurate or not exhaustive of the meaningfulness of the original complex word, it becomes a relatively simple matter to introduce or substitute other basic words in the machine translation process.

Keeping this analysis of the function of machine processed language in mind, I would like now to back off a moment and survey the problems involved in planning a long-range program for mechanized patent searching.

First of all, let us not be too pessimistic. The tremendous volume and intensity of investigatory and developmental activity during the past few years in the field of information data processing has provided the bedrock upon which a long-range program of mechanized legal and patent searching may now be built with some assurance that the edifice will not come tumbling down. Sufficient experience with specialized information storage and retrieval systems has been acquired that certain common denominators for a generalized system are emerging. It is now becoming possible to evaluate systems in accord with their contributions to the evolution of the art (or science) of documentation and to select those features of each type of system which will probably need to be incorporated in any large future system. Moreover, the corresponding evolutionary trends in computer technology have become fairly well defined so that we can extrapolate toward expectant "computers of the future" and tailor any long-range program to take advantage of and be compatible with future equipment.

The time for making the requisite analysis and for planning the main outlines of large searching centers has also arrived. Most professions whether technical, legal or medical have now been aroused to the acute problems inherent in the engulfing volume of published material, and the imagination of the public as to the potentials of mechanized information data processing is being captured. Money in fairly large quantities is being proferred from both public and private coffers and will be forthcoming in even larger sustained quantities as programs are tendered having good promise of long-range success.

Any such long-range analysis at this stage of the game is, of course, fraught with many dangers of omission, overemphasis, unpredictable technical or linguistic break throughs, etc. ad infinitum. However, despite these risks, it is believed worthwhile to make the attempt particularly if by doing so, others are led to challenge some or all aspects of the programs suggested and thereby give impetus to a sounder professional consensus as to the proper directions or emphasis. Accordingly, I shall hereby stick my neck out and set forth for your evaluation what I believe to be the technical requirements which must be met in any long-range program for mechanized legal searching.

At the outset, let me state what I believe to be some discernible trends in information processing computer equipment. Based on the recent history of computer development, it is believed fairly safe to predict continuing developmental achievement in the near future toward:

1. greater concentration of bit density on the recording medium
2. greater storage capacity in the computer itself
3. faster random access to stored data
4. higher speeds of data manipulation and comparison
5. higher speeds and reliability of input into and output from the recording medium
6. machine conversion (for example, by optical scanners) of ordinary printed text into machine usable recorded form

Also predictable of achievement but at a somewhat more remote future date is direct machine conversion of all types of "images" such as photographs and diagrams into machine usable recorded form as well as direct manipulation and read-out by the computer of the image itself.

Now, let me set forth what I believe to be some of the basic "documentational" and "operational" requirements for large searching centers.

Firstly, there must be "comprehensiveness" in the creation of the initial "master recorded file" for computer processing.

In the processing of any large file for computer use and pre-selection, screening of documents, abstracting, or indexing whereby any portion of the information is omitted, condensed, transformed or classified by human minds prior to its recording in computer-usable form will invariably lead to corresponding errors and omissions in retrieved or retrievable subject matter. As mentioned before, no two human minds can be reliably counted upon consistently to make the same decisions as to what material is to be included or as to the words to be selected for the abstract or index. It is far better,

(within economic boundaries provided by the law of diminishing returns) to record initially the entire text of all documents conceivably relating to the general subject matter desired to be searched.

The computer can then be programmed reliably to generate sub-classes or abstracts or indices in accord with programmed definitions and intentional margins for error adjusted in accord with empirical evidence. The excluded subject matter will thus be rediscoverable by inspecting the definition or program, any errors correctible, and the initial material still ultimately retrievable from other viewpoints, if desired.

Secondly, there must be procedures for direct retrieval at several different levels of "idea complexity". The differing nature of each file as well as the differing nature of and purpose to be served by the information to be retrieved requires great versatility in the manner in which the search question may be framed.

In one case, for example, it may be logical to search for all documents in which a given single word (representing a single concept) appears. In another case, it may be more logical to search for all sentences in which a certain phrase (representing a "complex concept") occurs. In yet another case, a search for all paragraphs containing a selected combination of key words or phrases (representing a "complex idea") may be indicated. Any large searching center should thus be able to accommodate all of these as well as a host of other possible combinations of specificity and genericity in the language and structure of the search.

Thirdly, there must be procedures within the computer for relating words and phrases of similar meaning to one another (thesaurus) as well as for relating complex-concept words to combinations of more rudimentary concept words which express similar meanings (semantic factoring).

For reliability in retrieval, it is necessary to normalize the language involved. The same idea may often be expressed by several hundred different combinations of words. In the ideal situation, the computer should be able (through language normalization techniques) to search for a given idea regardless of its various possible modes of expression in any document so long as the idea to be searched is submitted to the computer in accord with one of the possible modes of expression.

Here again, it is virtually impossible for different human minds reliably and consistently to accomplish this language normalization function even with external aids. Because of its complexity, this function must be done by the computer itself.

Fourthly, there must be procedures for determining and adjusting retrieval on the basis of the pertinency of the ideas as expressed in the various documents being searched to the idea as expressed in the search question.

In most cases, a searcher wishes to retrieve not only all documents which completely express the particular idea being searched (total coincidence with the terms of the search question) but also those documents which express similar ideas but not precisely the same idea. Moreover, experience has indicated that it is virtually impossible to frame a search question with sufficient accuracy and completeness that all possible variations of expression of a particular idea will be retrieved if all of the conditions of the search question must be met in the expression of the document.

By permitting an adjustable degree of leeway in the pertinency of the document to the question being asked, a predetermined amount of "overpull" can be achieved which will greatly increase the reliability of retrieval. As the requisite degree of pertinency is relaxed, a greater volume of documents is retrieved and reliability improves but the number of non-pertinent documents retrieved (false drops) also correspondingly increases. However, with any given type of file (i.e., legal, patent, medical, etc.), experience eventually indicates the pertinency factors which should be used with various types of search questions in order to obtain the best compromise between reliability and resolving power. Moreover, as the language normalization techniques, computer programs and question-framing techniques are improved and perfected, readjustment to ever higher degrees of pertinency will be possible until excellent reliability is eventually achieved at the sacrifice of comparatively few false drops.

Fifth, there must be procedures for "weighting" the various concepts (words or phrases) of the search question in accord with the relative importance of these concepts to the content of the search.

Particular words or phrases expressing one of the component concepts of an idea being searched might have far more significance to the searcher than other words or phrases expressing other component concepts.

For example, in a search for all patents disclosing semiconductor oscillator circuits having capacitive feedback, the concept "semiconductor" might need to be weighted more heavily than the concept "oscil-

lator" if the searcher considered that he had more interest in "semiconductor" circuits with capacitive feedback than in "oscillator" circuits with capacitive feedback. This also becomes important in the adjustment of pertinency factors. For example, in this search for a semiconductor oscillator circuit, the searcher might be willing to accept a pertinency of 80% between document text and search question if the text included the term "controlled-rectifier" or equivalent, but might require a pertinency of 90% if this term were not present.

Sixth, there must be procedures for statistical analysis of the words both in the total file as well as in the individual documents. This is helpful both in selecting the words of the search question and in programming the search itself. For example, the relative frequency of word occurrence is a good measure of its discriminatory value. Moreover, the number of times a given concept appears in a given document is some measure of the emphasis which the document places upon the particular concept in question, and thus may help decide pertinency.

Seventh, there must be procedures for determining the order of and relationship between words (syntax, role-indicators, etc.).

In some searches because of contiguity in meaning of a great many documents in a particular file, it becomes necessary to distinguish between the "dog bites man" and "man bites dog" situations. This tends to be particularly true where the search question requires the coincidence of only a relatively few (for example, less than 5) simple words or concepts. As the number and meaningful complexity of the words in the search question increases, the necessity to monitor the order of and relationship between words becomes less urgent since the probability that two different ideas will occur in a given file which contains the same combination of, for example, ten words in different order is very small. For example, while three words may have different meanings if in different relationship to one another, it is quite unlikely that both of these three-word relations will make sense when combined with seven other words to express a complex "idea". Nevertheless, in order to be able to handle all types of search requests, it is highly desirable that the computer search program of any large search center be versatile enough that particular relationships between selected words or concepts may be required to subsist before the text or document will be retrieved.

And finally, there must be relatively routine procedures for human and machine modification and improvement in accord with the results of actual retrievals of the stored and programmed semantic codes and their relationships.

In other words, there must be feedback refinement of the coding and programming. The reasons for this requirement are believed self-evident.

So much for the requirements of the system.

As far as the feasibility of this program is concerned, I would like to call attention to the activities of the University of Pittsburgh Health Law Center, under the direction of John Horty, which has already taken the first steps toward the development of a mechanized legal searching system which may ultimately fulfill all of the basic requirements for large searching centers enumerated above. At this Center they have already succeeded in transcribing the entire text of the Statutes of Pennsylvania onto magnetic tape. Each word is addressed in computer storage by its location in each sentence of each statute. An alphabetical vocabulary listing of all words in the statutes as well as their respective frequencies of occurrence has also been generated.

Searches are conducted on the basis of different combinations of words, selected by human minds from the vocabulary list, that are most likely to be found in statutes relating to the idea being searched. An attempt is made to include all synonyms of the words in each combination and the computer is programmed to identify all statutes in which the respective word combinations occur. The locations of selected words relative to one another can also be programmed during the search; for example, the words "room" and "board" can be programmed in the search question to occur within two or possibly three words of one another before the statute is retrieved.

It will thus be seen that this University of Pittsburgh activity already meets several of the documentational and operational requirements for large searching centers postulated above. First of all, since the full text of the statutes is read into storage, it meets the requirement for "comprehensiveness" in the creation of the initial master recorded file. Secondly, since a great variety in the number or combinations of different words in either sentences, paragraphs or entire statutes may be called for in the various search questions, it meets the second requirement of procedures for direct retrieval at several different levels of "idea complexity". Finally, it partially meets the requirement of procedures for determining the order of and relationship between words.

The requirements which remain to be met relate to the development of computerized procedures for searching through a file-generated thesaurus which includes the word linkages resulting from semantic factoring, as well as the generation of computer programs for adjustable pertinency and weighting factors which take advantage of prior statistical analysis of the frequency and discriminatory value of the various words in the total file.

Mr. Horty and his associates at the University have already embarked upon the task of creating a file-generated thesaurus. In conversations with them during a recent visit to the University, a tentative long-range step-by-step program for meeting the remaining requirements was laid out.

Now let me take a few moments to talk specifically with respect to the patent searching problems of the United States Patent Office.

It is well recognized that the mechanization of patent searching in the Patent Office must necessarily take several years. During this time, I believe we can expect the introduction of efficient optical scanners capable of relatively inexpensively and automatically reading the full text of a patent into storage, as well as the introduction of new computers with substantially greater storage capacity and more rapid access time. This will, for reasons both of economy and reliability of search, ultimately lead to the introduction of the full text of the entire or designated portions of each patent into storage thereby eliminating the need for two independent but difficult-to-harmonize human translations. The hopeful aspect of this likely evolution is that the experience currently being achieved in developing systems for classifying and retrieving in accord with coded indices will be useful in establishing the codes to be used by the machine rather than by the human mind in retrieving directly from the full text. In short, when the optical scanner finally arrives, we hope to be in a position to take advantage of it.

However, we must also begin to build up some actual experience in mechanized procedures for retrieving directly from the full text. For example, it is believed that reliability of technical information retrieval cannot be achieved with good resolving power at greater than the complex idea (paragraph) level, but this should be verified by experimentation. If it is true, each complex idea (paragraph or, in some cases, sentence) of the patent will need to be given a separate address in storage and to be independently retrievable.

Other questions to be answered are: how to form the search question, and how to program the computer with its stored glossaries, translations, synonyms, factored words and compiled words and phrases so that only patents of controllable pertinency will be retrieved.

In my opinion, the trained patent searchers of the future will merely express the search questions in precise natural language, and the computer will take each meaningful word in the query, factor it into its component meanings, recombine the various factored words in to all synonyms and complex words which convey identical or similar meanings and match these recombined alternatives against the text of the documents in accord with programmed syntactic relations and against a level of pertinency established by the searcher!

However, the starting point must be a rigorous analysis of the current mental gymnastics of a trained searcher as he reviews the full text of patents being searched. The building of technical glossaries which take into account the basic concepts inherent in complex words and ideas (and the various combinations of such concepts by which similar complex ideas may be conveyed) must also soon be undertaken somewhere. These activities should be undertaken and measured against a backdrop of actual experience in formulating retrieval questions and comparing the results against previous manual searches. They might well be tackled by the Universities in cooperation with the Patent Office. As another immediate step the full text of each newly issuing patent might be preserved in machine readable form by being automatically punched into paper tape as the type for printing the patent is set.

As yet another immediate step the full text of the patents in one relatively new but potentially important field of art, for example, cryogenics, may be placed onto magnetic tape, and experiments in retrieval from the full text begun. The experience resulting from such experiments would be invaluable as the computer programs for full text searching of larger and larger segments of the patent file are eventually developed.

From an economic standpoint, society can best afford this investigation where the document to be retrieved is per se valuable. It will be difficult to find any file of documents in our society other than patents where the document itself is so ideal for the experiment. A patent is a precisely written docu-

ment with little surplusage. Each sentence is ordinarily loaded with meaning. It has intrinsic value to society because of its informational content. Moreover, it has intrinsic value to society and to its owner as a property right.

For all these reasons, it is believed that industry, the public and the various Bar Associations should all support a greater effort toward the institution of investigations in the Patent Office with respect to the theory and procedures for searching the full text of patents upon the basis of machine processed basic language-type semantic codes. Such a program will also hold promise for the solution of some of the more subtle problems involved in mechanized searching of more general legal resource materials, such as judicial decisions.

Ladies and Gentlemen, the time for polite and disconsolate hand-wringing over insurmountable problems has passed. We must, as a nation and as a profession, begin to reach some common agreement as to a program for action if the rapid progress of our industrialized society is to continue. While the leadership and decisions must necessarily come from the United States Patent Office itself, the American Bar Association and the American Patent Law Association can be helpful in marshalling the resources and cooperation of the Bar in the furtherance of an agreed-upon program. The alternative is the slow strangulation of our patent system and a consequent erosion of private initiative. Let us not hesitate to speak out boldly and to act imaginatively and promptly.

APPENDIX B

Summary of Answers to Questionnaire

The patent offices of the countries invited to attend the International Patent Office Workshop on Information Retrieval were requested to answer a questionnaire directed to patent classification and search facilities and the material searched when examining a patent application. Replies were received from the patent offices of Australia, Austria, Canada, Denmark, Germany, Japan, The Netherlands, Norway, Sweden, the United Kingdom, the United States and from the International Patents Institute.

The attached pages contain a summary of the answers to the questionnaire, prepared by W. S. Cole, Assistant Primary Examiner, Division 94, U.S. Patent Office.

1. Which of the following criteria are used as a basis for a patent grant? A. Novelty; B. Utility; C. Invention.

Summary: Novelty, utility and invention are all essential to patent grant in each of Austria, Canada, Denmark, Germany, Japan, the Netherlands, Norway, Sweden and the U.S.A. In Australia and the United Kingdom, novelty and invention are the only requirements but, procedurally, in the United Kingdom the question of lack of invention is raised, if at all, only at the opposition stage (after publication but before grant). The question of basis for grant of a patent is of course not relevant in the case of the International Patent Institute which does not issue patents.

2. Which of the following types of literature are searched in determining patentability? A. National patent literature; B. National technical literature other than patents; C. World wide patent and other technical literature.

Summary: During the examination of an application for patent the available patents and technical literature of the entire world are searched by Austria, Germany, Japan, Norway, and the U.S.A. The International Patent Institute conducts searches on a similar scale to determine novelty of disclosure or validity of patents. The United Kingdom and Australia search their own "patent literature" (i.e. patents and patent abstracts) but while the search of patents of other countries and of other literature is discretionary, it is apparently not usually undertaken. The Netherlands search includes patents of Germany, United Kingdom, France, U.S.A., Switzerland, Belgium, Luxembourg and the Netherlands and other literature to a limited extent. Canada and Denmark search their own patents and technical literature and to a limited extent that of other countries; Denmark's search includes patents of Norway, Sweden, Finland, Germany, France, the United Kingdom, and the U.S.A. Sweden's search is compulsory through the patents of Sweden, Denmark, Finland, France, Great Britain, Norway, Switzerland, Germany and U.S.A.

3. Is the search made A. Without regard to the age of the literature? B. If there is an age limitation on the literature which is searched, state the limitation.

Summary: Germany does not search patent and technical literature which is over one hundred years old. In the United Kingdom and in Australia, foreign and domestic patents which are more than fifty years old and official extracts thereof may not be cited. However, in the United Kingdom technical materials other than patents may be cited regardless of age. Austria, Canada, Denmark, International Patent Institute, Japan, the Netherlands, Norway, Sweden, and the U.S.A. may employ available domestic or foreign patents and technical literature regardless of age as evidence of unpatentability.

4. Indicate which of the following are permissible subjects for a patent grant. A. Manufacturing process; B. Non-manufacturing process; C. Machine; D. Article of manufacture; E. Static structure; F. Materials from which articles are manufactured; G. Chemical compounds; H. Admixtures of chemical compounds with other substances.

Summary: The different types of inventive subject matter upon which a patent may be granted include; (A and B) Manufacturing and Non-

Manufacturing processes, (C) Machines, (D) Articles of Manufacture, (E) Static structures and (H) Admixtures of Chemical compounds with other substances in Australia, Canada, Germany, Denmark, Japan, the Netherlands, Norway, Sweden, the United Kingdom and the U.S.A. However, while Canada may allow certain types of non-manufacturing processes which involve, for example, prospecting, mechanical analysis and electrical communication, other non-manufacturing processes such as medical or surgical procedures, agricultural methods, chemical analysis and the application of pesticides and the like are not allowed. Some agricultural, medical and biological processes are also excluded in the United Kingdom. In the Netherlands new materials are not patentable per se but may be protected by a patent claiming the method of making the material even where this method is not inventive. A patent is permissible for chemical compounds admixed with other substances which have some shape, e.g., fibres, flock, webs, yarn. Mere chemical admixtures fall under the practice outlined under (G) below. The United Kingdom, Japan and Australia refuse chemical mixtures which consist of foods and medicines whose ingredients act in concert in the same manner that they would act individually. This is also true for Canada where the principle extends to all mixtures and parts of machines and is called "mere aggregation." In the U.S.A. therapeutic or medicinal inventions must have proved efficacy to be patentable. Austria grants patents for manufacturing and non-manufacturing processes, machines, articles of manufacture and static structures but not for non-manufactured (i.e. raw) materials, chemical compounds or admixtures thereof. With respect to Item (F), materials from which articles are manufactured may form the basis of a patent grant in Australia, Canada, Denmark, Germany, Japan, Norway, Sweden, the United Kingdom and the U.S.A. In Germany and Norway alloys may be patented and in the United Kingdom, any new substance which is a product of manufacture such as an alloy, food or drug may be patented. In the two preceding cases, the alloys may be regarded as a species of Item (F) (i.e. materials from which articles are manufactured) since this is the usual use of an alloy. In Germany, the application of a known material to produce a known article is not patentable if it represents a mere replacement without the creation of a new effect. As to Item (G) claims to chemical compounds may be allowed in Australia, Canada, the United Kingdom and the U.S.A. In the Netherlands, in Germany and in Norway the raw material or chemical compound can be protected only by means of a claim reciting its method of manufacture, as stated before. Denmark does not allow claims to a chemical compound, but to the use of the compound. In addition, foodstuffs, table luxuries and pharmaceuticals are often not patentable in Germany. Miscellaneous types of subject matter are considered appropriate for a patent grant as follows: In Canada, viruses and vaccines may be patented but not plants or bacteria. As to antibiotics, Norway grants patents for manufacturing processes only. The U.K. and the U.S.A. also grant patents for antibiotics. In the U.K., methods of test applicable to the control of manufacture are patentable. With respect to Items F, G and H, however, a patent may not be granted in the U.S.A. for a raw material or chemical compound or admixture which is a naturally occurring substance, and in the U.K. patents for new substances do not extend to the substances when found in nature. The U.S.A. may grant patents for ornamental designs based solely upon appearance and patents for botanical discoveries and inventions in the nature of asexually produced new plants, provided that they are not tuber propagated and are not found in an uncultivated state. Bacteria are not patentable in the U.S.A.

5. When searching, which of the following criteria are used to determine the relevance of reference documents? A. Novelty is the sole consideration; B. Analogous arts are considered; C. A doctrine of equivalents is relied upon.

Summary: In part (A) of this question, it must be remembered that part (A) is closely related to parts (B) and (C). That is to say, in part (B), analogous arts are searched where known *uses* of substantially the same concept as that sought would be considered a valid reference and in part (C), since it is rare indeed to find the exact subject matter sought, the question is the degree of difference over the prior art which would result in a finding of patentability. Equivalents are usually particular examples where this degree of difference is not sufficient to predicate patentability on the ground that the improvement, although somewhat different than the prior art, is not inventively different. In each of Austria, Australia, Denmark, Germany, Japan, the Netherlands, Norway, Sweden and the

U.S.A., analogous arts are considered and a doctrine of equivalents is relied upon. In Canada and in the United Kingdom, the doctrine of equivalents is applied cautiously. Canada and the United Kingdom also rely upon references from analogous arts but the United Kingdom applies such references cautiously. Probably all countries use the concepts of B and C cautiously. In all countries the question of whether particular arts are "analogous" must obviously be decided in each case. In the U.S.A. the test usually relied upon is to examine the various arts involved to see whether the problems in each case are so related that one skilled in one art would realize that he could find a solution of his problem in the other art. This involves the problem that certain areas of two arts may be closely parallel while other portions of the same arts may be remote from one another.

6A. The following relate to your presently available facilities for manually searching documents or their facsimiles. A. Have you adopted the International Patent Classification System? Have you used it as a guide or pattern in developing your own system?

Summary: There was some confusion as to whether "adopting" the International Patent Classification System meant that the patents would be physically divided into groups in accordance with I.P.C. for search purposes or whether another system would be used for this purpose and the patents merely marked with the I.P.C. along with that primarily employed. With this in mind, Australia, Denmark, Germany, the Netherlands, Norway, Sweden and the United Kingdom have indicated that they have "adopted" the International Patent Classification System which is interpreted to mean that their patents, as they currently issue, at least have the I.P.C. number printed someplace thereon. Austria, Canada, the International Patent Institute, Japan and the U.S.A. have indicated that they have not "adopted" the I.P.C. System. Denmark, Germany, Norway, the Netherlands and the United Kingdom has indicated that they have used the I.P.C. System as a guide in "developing" their own systems. Since it is a huge task to reorganize an existing, comprehensive classification system and in view of various explanatory statements in the answers to this question it appears that the existing classification systems of the above countries are being retained but any necessary future changes or revisions will be made in a manner conforming as nearly as possible with the I.P.C. System. Austria, Canada, Japan, and the U.S.A. have not used the I.P.C. System to any extent.

6B. Briefly describe the classification system used.

Summary: With respect to the type of classification system used, Denmark, Germany and Norway employ a system in which the "invention" is the basis of classification. This need not be restricted to the exact combination recited in the claims and judgment may be used in interpreting the claims to decide where the invention really resides. The claims may be cast in a form which would be classified in one class but the examiner or classifier will look beyond the form of the claims and classify the application (or patent) in a different class which he feels more closely provides for what he considers the actual improvement. Since the Netherlands system is based on the German system, they therefore classify the "invention" in the same manner, but moreover, other striking, newly disclosed matter is classified. Australia, Canada, Japan, the United Kingdom and the U.S.A. each has its own system adapted to its own peculiar needs as dictated by its own economic system. The U.K. employs a system in which the "disclosure" is the basis of classification, the invention claimed not necessarily determining the index of the specification. The Australian system is briefly described in a pamphlet entitled "Classification of Subject-Matter for Patents of Invention" dated October, 1960. In the U.S.A., the claimed matter constitutes the basis for classification. If the claim is not considered commensurate with the invention, the examiner may try by various rejections and examination procedures to get the applicant to substitute claims which more nearly conform to the examiner's view of the invention. The applicant however may not agree with the examiner as to the exact scope of the invention and may resist this rejection with various recourses to appellate tribunals. Canada, the United Kingdom and the U.S.A. state that they have definitions with explanatory notes for the various classes and headings or subclasses. It is probable that many countries employ some definitions since the titles of the schedules are necessarily brief and concise for rapid visual selection. The type of subject matter selected for classification obviously determines its value to the searcher and is influenced by the type of claims or inventions to be classified, the philosophy of the classifier, the statutes governing patents and the

decisions of the courts having jurisdiction over the patents issued. Since the different classes in the U.S.A. system are diverse in nature and format some experience has been gained in the use of the various possible schemes. It has been the experience of examiners in the U.S. that classes which use concepts based upon *obvious* characteristics of a particular art permit extremely simple and quick classification but are relatively useless for finding the type of art necessary to examine applications where there is novelty present. No substitute has been found for careful evaluation of the problems presented in the claims and selection of unique features which distinguish the invention from all others and which features will generically provide a search field for species thereof as they appear in new applications. Exceptions are found in most classes in the form of "art groups" in which various problems in a particular industry are accompanied by other problems which seem to have no existence apart from the particular industry and defy analysis on their own merits. These groups usually constitute the exception rather than the rule in our recent classes. Canada on one hand preferred to use classes based on either scientific and engineering concepts or functional or utility concepts related to the intended use of the invention. The Netherlands, on the other hand, stresses classification based on function more than Germany but less than the U.S.A. The International Patent Institute uses the patent classification system of The Netherlands. The U.S.A. and probably most other countries fall between these extremes and use classes of both types. The United Kingdom indicates that they have classes which have been subdivided into "Headings" which are then further subdivided as necessary. There is stated to be a "tendency towards general headings rather than headings restricted to a particular field." The final subdivisions of the heading have "press-marks" on "classification marks" allotted to them and correspond either to search files or to clips (indicated by colour, position or both) on search files. Each specification together with its drawings and a printed abridgement is mounted on a card along the top of which are the clips indicating the appropriate "press marks." Normally, the entire drawer file does not need to be perused but only those cards having the appropriate clips. This serves, in part, as a substitute for physically separating the cards into separate bundles and in many cases eliminates the need for cross referencing from one such bundle to another where plural concepts appear. It also, moreover, has the advantage of enabling combination clip searching to be employed. In the U.S.A.: (a) Technology is divided into five general areas of knowledge. (b) Each area is further divided into an hierarchically arranged number of *classes* or main subjects fields. At present some 309 are in use, each with subject matter definition limiting its cope and having notes giving related subjects fields. (c) Each class is further divided into an ordered arrangement of subclasses, superiority of subject matter being indicated by the order of the subject in the plan or scheme, the first appearing at the top of the schedule being superior to the last appearing. At present the system includes some 59,000 such subdivisions, each with definitions and notes to indicate scope and related or excluded subject matter. (d) The system looks to identify relationships of concepts and constituent parts on as near a proximal function basis as possible. (e) The title of the subclass indicates the subject matter *included* and patents are thus not excluded therefrom because of some additional function, structure or relation unless the title specifically uses words limiting the scope thereof.

6C. How is the system used? (e.g. in determining placement of patents and cross referencing).

Summary: It appears that many countries answering this question collect patents of each subclass (or subdivision) number together into a group or bundle which may be inspected as a group to search concepts provided by the particular subclass. Cross references i.e., additional copies, are placed in other subclass groups where they would be of interest to one searching the other subclass. Germany alone noted that they used "only one classification symbol with no reference". However this refers only to the use of such symbols. In the search files every specification is cross-referenced as required. Sweden follows Germany in this respect. Norway employs cross references and prints them on the patents. The examiners decide which cross references should be printed. The Netherlands employs cross references using some complete and some partial copies. Denmark employs cross-referencing to a limited extent. In Japan, the classifier places a rough classification showing class and subclass on an application and after examination the examiner gives a subdivision mark, noting desired cross-references, if necessary. The classification examiner finally checks the classification mark. In Australia the system is used to classify the pending applications for examination

and for collecting patents, abstracts and the like into groups having the same class number for searching. Each disclosure may have any number of "class marks" or press marks as both claims and disclosures are classified. In the U. K., the whole of the disclosure is considered for index, "cross-referencing" (in the U.S.A. sense) being used to a considerable extent and being limited solely by the defined relationships betwen headings and by the examiners, who are at liberty to decide that repetition in any particular heading would not be fruitful. Complete copies of the specification (and abridgement) are almost always placed in each file in which the specification has been indexed. As in the U.S.A., lists containing the serial numbers of all patents classified in each subdivision are tabulated by machine and are on sale to the public. In the U.S.A. lists containing the numbers of all patents classified in each subclass are tabulated by machine and may be purchased for use in searching patents arranged in numerical order in various libraries throughout the U.S.A. With respect to the placement of patent copies in the U.S. Classification system: (a) The claims of the patent precisely define the difference or advance over what was previously known. Based on the patentee's definition of the invention, the placement of the advance in the hierarchical scheme is determined. (b) Where claims to different classes of inventions are present in the same case precedence is given in the following order:

(1) Process of using Article
(2) Article used or Manufactured
(3) Process of Making Article
(4) Machine for Making Article*
(5) Composition or intermediate subcombination

*The Machine for Making the Article (item 4) is itself an article and would move up to item (2) if it were the item made by item 3 or by another machine (item 4)).

(c) Claims to the type of subject matter which appears first in the above paragraph (b) are said to control "original" classification and will cause one copy of the patent to be encoded to an appropriate class and subclass for that item. Other copies ("cross-references") will also be encoded. (d) Cross-referencing falls into two procedural categories, i.e.—mandatory and optional. Mandatory cross references result from claimed subject matter for which a subordinate subclass has been established. Optional cross references result from unclaimed but disclosed subjects matter for which a locus has been provided in any class. (e) Within the selected class as determined by (b) and (c) above, the encoder starts at the top of the class scheme or schedule of subclasses and rejects each of the coordinate main line concept designations until the subclass as titled and defined includes the subject matter of the patent claim. Each subclass has a definition which recites a unique concept and distinguishes the concept from that of other subclasses.

6D. How is the classification system controlled and maintained on a current basis?

Summary: With respect to the problem of keeping the various classification systems current in order to provide for new and different types of inventions; Canada and the United Kingdom make revisions and additions either because the classification division recognizes the need or because the examiners suggest the change due to search difficulties. In Australia, new classes are opened up infrequently and the tendency is to try to force the application and patents into the existing classification framework wherever possible. Germany makes revisions as necessary and all revisions are made "in collaboration with the Working Party for Classification of the Committee of Experts on Patents of the Council of Europe" and conform generally to the International Patent Classification System so that these systems should tend to approach the I.P.C. system after a period of time. The Netherlands makes revisions if necessary with respect to search. If an I.P.C. draft of sub-division is available they strongly urge a revision according to that draft. If such a draft is not available they rarely discuss matters in the Working Party, but follow the general trend of the practice of the Working Party. Denmark, Norway and Sweden keep their systems up to date by adopting the current changes and revisions made by the German Patent Office, whether they have an immediate need therefore or not. Japan's reply indicates that major revision of their entire classification system is attempted occasionally by adding new classes, subclasses and subdivisions to the present system. On the other hand, the U.S.A. replaces outmoded classes which are still active by more modern classes on a piecemeal basis. Several classes may be abolished or combined and re-established as a new class or, in many cases, the class is merely re-arranged to make the material classified therein more available. During revisions, patents which belong in other classes due to errors or to interven-

ing changes in other classes are transferred to the other classes. The classifiers are grouped into five divisions each having specialized jurisdiction of a related group of classes. Different classes are revised simultaneously, each revision constituting a project having its own leader and a number of classifiers dependent upon the size of the project. The Japanese Patent Office has indicated that they plan to make a reference book to correlate their classification with foreign systems. It is presumed that this could also be in the form of search notes for each subclass in any system which would advise a searcher to continue the search in certain stated subclasses in each of various foreign classification systems. The U.S.A. and other patent offices (e.g. The Netherlands) have attempted to solve this problem by incorporating foreign patents into their own systems and collecting them in drawers or bundles contiguous to their own patents and cross-references of the same subclass. The foreign classification is of some help in this operation where there is a language problem. The Netherlands has indicated that they use "partial copies" extensively as stated above. In the U.S.A. such partial copies are referred to as "digests of patents" and are usually reserved for small but important portions of rather large patents in order to conserve space and time in locating the pertinent matter in the patent. The term "digest" is unfortunate since this term is also used to designate unofficial collections made by examiners for use by themselves and other examiners. Persons outside the Patent Office are usually allowed to search the latter "digests" although they exist in the examining division only. There is no contention that such digests provide a complete search. Sweden indicates that examiners subdivide patent material for their own use. In the U.S.A., the Patent Office classification is maintained by about fifty professional members of the classification group who put their work into the system each year revising, updating, and creating classifications. This does not include the encoding of some 50,000 new patents which issue each year, nor other technical literature and foreign patents which are classified into the existing system by other employees in the Office.

6E. Which of the following are included in your plans for future activity in this area? 1. Improving or reworking existing classification schedules. 2. Adopting new theories or differently based classification schemes.

Summary: As to whether the various countries intend to maintain their present systems or adopt new theories or differently based classification schemes, Australia, Austria, Canada and Japan state that they will maintain their present system, where acceptable, but look for new classification ideas at all times and revise old classification schedules in accordance with the plan most suitable to the particular subject matter involved. Denmark, Germany, the Netherlands, Norway and Sweden are changing over to the I.P.C. system as revisions are made.

6F. 1. Are foreign patents filed in their national classification scheme? 2. If the answer is "no", how are foreign patents classified in your existing system? 3. What foreign collections of patents do you have?

Summary: As to the manner in which foreign patents are filed in the various Patent Offices:— Austria, Germany, the Netherlands and the U.S.A. file foreign patents in the same classification system as their own patents and presumably search them together. Japan has the patents of 39 foreign countries. Such patents are arranged in numerical order, except those of the U.S., United Kingdom and Germany, which are classified according to their own classification. Canada files the U.S. patents in accordance with the U.S. classification printed thereon at issue and has the patents of other countries arranged in numerical order. Norway files British and French patents in The Netherlands' system, U.S. and Austrian patents in their own national classification scheme and most other patents under the German system. Each country's patents are arranged in separate cases marked by different colours. Denmark files patents in their national classification systems except that the British and French patents are filed according to the Netherland's system, similarly to Norway. Australia does not search foreign patents and therefore has no need to keep them in any classified order. Sweden arranges the U.S. patents in accordance with the U.S. system and all others are assimilated into the Swedish system. The United Kingdom absorbed older U.S. patents (prior to about 1940) into their national system, one copy being encoded by the examiner on a best utilized basis, and maintains in their Library numerically arranged collections of patents of other countries (in the case of recent German specifications, the Library has them arranged in their own national classification sys-

tem) since, as stated above, the latter patents are not usually searched. Regarding the number of countries whose patents are on file at the various patent offices, no particular pattern is apparent except that (1) most patent offices appear to have foreign patents from Belgium, France, Germany, Switzerland, the United Kingdom and the U.S.A. (2) Many countries have on file patents from neighboring countries and countries having similar languages or economies.

6G. What aids to manual searching are utilized?

Summary: Aids to manual searching. This area is construed to include all devices and expedients which would aid in selecting actual patents, photographic or printed reproductions thereof or abstracts thereof, each of which would have to be visually inspected for selection or rejection. Definitions may be considered an aid to searching and these have been mentioned above. An index may also be of value to locate concepts but semantic problems limit its use. Canada, Germany, the Netherlands, the U.S.A. have such indices and the International Patent Classification System has a list of "catch-words". The problem is that the same word has different meanings to different people; not only to people in different countries but people in different industries or in the same industry at different times, even in the same country. Such an index could provide a central place to define each word indexed as used in each of its occurrences but this apparently has not been done. It would also be useful to use ample cross index or reference items for synonyms. Japan stated that they used abstracts on search cards. The U.K. uses abridgements as well as the original classifications on their search cards and also uses annotations (lists, flow-diagrams, etc.) as well as the filing and clipping system referred to above under 6B. Australia employs (1) index cards for each class subdivision having thereon the application numbers of all disclosures having the subject matter provided for by the subdivision, (2) classified sets of patents or abstracts (3) classified records of pending, unpublished applications, and (4) search notes privately maintained by the examiners.

Cards with abstracted information and possibly with a small reproduction of a patent thereon may be searched by various means. A common way is to assign a symbolic meaning to each of numerous holes at the edges of the card. Each card would then have the edges removed except for the portion having a hole or plural holes corresponding to an encoded disclosure in the reference. The cards may then be selected by passing a long rod thru the aligned holes corresponding to a concept sought, in adjacent cards. The rod would then remove only the desired cards from the pack. "Peek-a-boo" cards could be similarly arranged but selected in response to passage of a light beam thru a specified portion of the card corresponding to the concept desired. The International Patent Institute has a punched card digest for luminescent material and is completing another for chemical treatment of textiles and a Batten card digest for laminated materials. Germany uses manually selectable punched cards for patents relating to breweries, pumps, steroids, locks, printed circuits, aircraft engines, building construction parts. In the Netherlands, where multiple classification is thought necessary within restricted fields only, it is used without the need of more than one copy by means of a special arrangement of the specifications. This is done by fixing the order of any possible combination of search features of the system and arranging the specifications accordingly. The specifications on electrical control and on automatic telephones are made accessible by use of multi-column scan lists. Those lists have one column for the specification number and one for each of the search features. There is also a special card system on azo dyes. The United Kingdom plans to use Batten cards extensively and presently has collections of luminescent materials and packaging and has in preparation digests of recording, textiles and cathode ray tubes. An additional digest on steroids is being considered. A modified Brisch-Vistem device will be used for these searches. The United Kingdom also plans to use "Findex" punched cards in cooperation with a micro print reading device. Australia plans to investigate the Batten (inverted file) manual searching system. It would seem that punched cards of this type could be transcribed mechanically at a later date if sorting machines or computers eventually were used. On a trial basis in the U.S.A., microfilm cards have been substituted for the patent copy and an optical reader is used in searching. In some examining divisions an abstract or digest of the patent is written out on a card and then cards are filed (unofficially) according to some plan and then used as a basis for search. In at least one area a "finder list" is developed for each patent, appropriate places are checked for a developed scheme of rather frequently occurring

types. The lists are then searched to identify patents having the type feature desired.

7. The following relate to mechanized searching. A. Do your search facilities include a mechanized search system? B. Give a brief description of the mechanized system employed, the equipment used and the area(s) of technology to which it is applied. C. What are your present activities in and future plans for conducting research in the mechanization of information storage and retrieval?

Summary: With relation to mechanical searching systems it is noted that some of the devices considered under question 6G could be considered "mechanical searching devices" from some points of view. Remaining for consideration are the more or less "automatic" devices for selecting cards manually placed into the machine. The International Patent Institute is preparing a punched card search file from the multi-column scan list on electrical control in the Netherlands Patent Office which is to be searched on a multi-column sorter. Japan is investigating the use of mechanized searching systems and plans some experiments in mechanical searching. The United Kingdom has cards for computer searching on "packaging" and on "coating with metals". Denmark, Norway and Sweden are searching U.S. cards on Steroid compounds and when available may use U.S. cards for "Organic phosphorus compounds" (U.S. class 260, subclass 461). Norway employs a "Norsk Regnecentral"—Bull D–3 Electronic Computer while Sweden uses IBM type 85 and type 101 machines. No present plans have been reported to extend this type of searching. The Netherlands reports that they have mechanical searching plans under study but are not presently using this type of equipment. Australia has no present research activity. With respect to work on mechanized searching in the U.S.A., three mechanized searching systems are in current use:

1. Steroids have been searched on an IBM–101 since August, 1957. Direct coding is used, each punch position of a standard IBM card being reserved for representation of a particular feature which is superimposed on an assumed, fixed steroid nucleus. For example a punch in one particular location indicates a double bond at position 5. The file includes U.S. patents and a substantial coverage of periodical literature.

2. Organic phosphorous compounds are searched by a system called RAMP which uses the IBM RAMAC–305. Partial use of this system began in January 1961 and full operational use has been in effect since October 1 of this year. A punched card version of this system, called CAMP, is also used, employing the IBM–101. The file, which includes about 2000 patents, is in the inverted file form. Entries are based on functional groups and the most specific level of the file lists documents describing compounds containing all of the groups asked for, a list of document numbers is printed out.

3. Transistor circuits are searched by a peek-a-boo system that now contains about 900 patents in the file. Another 1100 patents are being analyzed and coded for addition to the file. The topology of the circuits and some of their general characteristics are recorded. Access to copies of references found by the search is by means of a Lodestar Microfilm Reader. Consideration is being given to the use of the Microcite Reader developed by the National Bureau of Standards.

A number of experiments are in progress dealing with a variety of problems and encompassing a number of subject matter fields.

(1) In the field of the mechanical arts, a method of recording and searching hydraulic circuits is being developed. Symbology for the mechanical elements and fluid flow-paths are being worked out in such a way as to permit tracing through any of the operational sequences present.

(2) A hand sorted punched-card system for recording information about artificial respirators is being developed.

(3) A system known as PACIR, which will store and retrieve patents on pesticides, is now in the development stage. Two versions will be available: one is for use with the IBM–RAMAC 305; the other being a punched card system for use with the IBM–101.

(4) On the HAYSTAQ project, a computer system for chemical searching, an intensive testing and evaluation of the topological structure search routine has been started. This is designed for handling any compound of known structure and permits considerable flexibility in framing questions. This is now programmed for SEAC at the Bureau of Standards, but consideration is being given to reprogramming for the 7090. Work was begun this summer (1961) on means for enabling computers to do most of the encoding of information extracted from the documents by trained chemists.

(5) An experiment has recently been started in which the full natural text of 100 transistor patents

will be made available for processing by a general purpose computer. A variety of approaches to automatic indexing and full text searching will be used and several linguistic techniques will be employed.

(6) Notation systems are being developed to enable a computer to store and retrieve complete electronic and electrical schematic diagrams. Linear, lattice and matrix notations are being investigated.

(7) A number of other projects, not immediately applicable to searching systems, have been, or are, in progress. (a) A system of symbolizing chemical reactions and processes, which emphasizes the sites of reaction, was developed and a report is available. (b) A new, comprehensive enumeration and linear notation system for chemical compounds has been worked out and will be described in a publication which is in preparation. This system is such that every compound has a unique cipher and every cipher can be translated unambiguously to a unique structure. The regularity of the method has permitted development of an algorithm for converting a linear cipher to a cathode ray tube display of the corresponding structure. (c) Some work has been done on the application of document storage and search techniques to searching for legal decisions on certain aspects of the patent law, particularly as related to design patents. (d) Work of a more theoretical nature on linguistic problems, particularly various relationships indicated between elements of information in a text, and the study of prepositionals in the English language, is not at the moment active. This work was directed at the ultimate establishment of an unambiguous metalanguage for storage of documentary information. (e) Some support has also been given to the investigation of formal linguistics and the processing of pictorial information which is being conducted at the Bureau of Standards.

The achievement of a fully mechanized information retrieval system for Patent Office use cannot be realized without solution of many basic problems of a theoretical nature, as well as system and hardware advances. It is anticipated that there will be considerably expanded effort in these directions while continuing to make use of presently available techniques.

APPENDIX C

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at the

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